DOCUMENT RESUME

ED 021 614 PS 001 006

By- Etzel, Barbara C.; And Others

HEAD START EVALUATION AND RESEARCH CENTER, UNIVERSITY OF KANSAS. FINAL REPORT ON RESEARCH ACTIVITIES.

Kansas Univ., Lawrence. Dept. of Human Development.

Spons Agency- Institute for Educational Development, New York, N.Y.; Office of Economic Opportunity, Washington, D.C.

Pub Date 30 Nov 67

Note- 293p.

EDRS Price MF-$1.25 HC-$11.80

Descriptors- CONDITIONED RESPONSE, CULTURALLY DISADVANTAGED, *DISCRIMINATION LEARNING, EXCEPTIONAL CHILD EDUCATION, *HEALTH PROGRAMS, INTELLIGENCE TESTS, LANGUAGE HANDICAPPED, *LANGUAGE RESEARCH, MIDDLE CLASS, PEER RELATIONSHIP, *PRESCHOOL CHILDREN, RETENTION STUDIES, SOCIOECONOMIC INFLUENCES, *SPEECH THERAPY, STUDENT BEHAVIOR, TEACHER BEHAVIOR, TEACHING TECHNIQUES

Identifiers- Anthropometry, *Head Start, Jenkins And Palermo Normative Word Lists

This document is the final report to the Institute of Educational Development for Head Start Research Evaluation activities at the University of Kansas for 1966-67. It contains 16 separate reports of studies completed or in the process of completion. The subject matter of the reports contains 15 distinct topics and warrants individual abstracts. The 15 abstract numbers and topics are as follows: PS 001 218 (reinforcement behavior of teachers); PS 001 219 (auditory discrimination); PS 001 220 (verbal imitation); PS 001 221 (language program); PS 001 222 (brie oral responses); PS 001 223 (peer group influence); PS 001 224 (reinforcement of intelligence); PS 001 225 (differentiated speech response); PS 001 226 (color labeling); PS 001 227 (errorless discrimination of delay of reinforcement); PS 001 228 (gross motor responses); PS 001 229 (physical development); PS 001 230 (matching abstractions); PS 001 231 (social reinforcement); and PS 001 232 (verbal recall). (WD)

Final Report on Research Activities
November 30, 1967

University of Kansas Head Start
Evaluation and Research Center

Dept. of Human Development
Lawrence, Kansas

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THE UNIVERSITY OF KANSAS HEAD START
EVALUATION AND RESEARCH CENTER

14 Carruth O'Leary
Lawrence, Kansas 66044

November 30, 1967

Dr. Dale E. Bussis, Program Director
Institute of Educational Developmental
52 Vanderbilt Avenue
New York, N.Y. 10017

Dear Dale:

The attached material represents our final report to I.E.D. for Head Start Research and Evaluation activities in 1966-67.

Evaluation: We consider the data that we submitted in August on our evaluation efforts to be our total report in this area. We are purposefully not submitting any qualitative material concerning the evaluation material since we feel that is not functional, and even in some cases detrimental, to the project as a whole. On an earlier ocassion this material had been asked for by Jerry Kline. At that time we asked our research assistants to write qualitative material about the centers (teachers, children, facilities, etc.) In looking over their reports it became very clear that two observers would often disagree about the same center. Further, the type of qualitative material that they were reporting was never mentioned to our sample centers as material which would be collected. Consequently, not only do we feel that any data of this type lacks reliability but that we are also not acting in good faith with our sample centers concerning the data that we told them that we would collect. Our evaluation report then stands on the objective data that was turned in earlier.

Research: Our research efforts are reported in the following seventeen reports. Each is reported separately by the experimenter in charge. A table of contents precedes these reports and lists each study and its investigators. The results of two studies are not included in the present report. Both are listed and will be submitted as a supplementary report at another time. We are sorry for this delay, but to make a long story short it was completely unavoidable.

We at the University of Kansas would like to thank you for your generous help during the past year.

Sincerely yours,

Barbara C. Etzel

Barbara C. Etzel, Ph.D.
Associate Professor, Human Development
Faculty Advisor, K.U. Head Start E&R Center

Frances Degen Horowitz

Frances Degen Horowitz, Ph.D.
Chairman, Human Development

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The University of Kansas Head Start Evaluation and Research Center

I.

"The Observation of Reinforcement Behavior of Teachers in Head Start Classrooms and the Modification of a Teacher's Attending Behavior."

Margaret Cooper, M.S.

Carolyn Thomson, M.A.

Department of Human Development

The Experimental Modification of Teacher Attending Behavior[1]

Margaret L. Cooper and Carolyn L. Thomson

Department of Human Development
University of Kansas

ABSTRACT

Running head: Modification of Teacher Attending Behavior

This study was designed to develop a method of observing and modifying the frequency of teacher attention to appropriate child responses in two preschool classrooms. Two teachers with no formal training in reinforcement principles were observed for a baseline of eight days. Teacher A, with the lower baseline rate of attending to appropriate child responses, was selected to be trained first. Teacher B served as a control for Trainer-Teacher interaction during the first part of the Training condition for Teacher A. Feedback during Training Phase I included the frequency of attentions given to appropriate child responses every ten minutes and the total percentage of attending to appropriate child responses at the end of the day. Training Phase II included feedback given during Phase I plus the frequency of unattended responses. Teacher B was trained in a similar way. Both teachers showed an increase in attending to appropriate child responses and a decrease in occurrences of unattended appropriate child responses. Attention to disruptive responses remained at about the same rate for both teachers during the study. The rates of attending to appropriate child responses increased more dramatically following feedback which included occurrences of unattended appropriate responses than when feedback was merely the number of times appropriate responses was attended. Higher rates of attending were maintained during the Probe than during Baseline.

Submitted: August 1967

The Experimental Modification of Teacher Attending Behavior[1]

Margaret L. Cooper and Carolyn L. Thomson

Department of Human Development
University of Kansas

INTRODUCTION

Studies in adult social reinforcement of individual child behavior have shown that teacher attention used contingently is an effective stimulus in producing change in the child's behavior (Allen, Hart, Buell, Harris, Wolf, 1964; Coats, 1967; Foxwell, 1966; Harris, Johnston, Kelly, Wolf, 1964; Hart, Allen, Buell, Harris, Wolf, 1964). These studies suggest that using attention effectively is a highly specialized skill. Previously the researchers involved in social reinforcement studies have been persons who had a competent understanding of the reinforcement process as well as experience in the practical application of social reinforcement.

This study asks whether the behavior of a teacher who has had no training or study in the use of reinforcement principles can be modified to become similarly effective. Social attention can be an effective reinforcer as the studies referred to above have shown. This study uses social attention in the form of feedback as a reinforcer for teacher behavior. If such feedback is in fact a reinforcing event, a modification of that teacher's behavior might occur. The particular teacher behavior to be studied is the teacher's attention to desirable child behavior.

METHOD

Two teachers from separate schools were selected for observation.[2] The teachers taught in schools serving low income districts of a large midwestern city. Both teachers had college degrees and had taught previously in a Head Start program. The teachers and children were of the same ethnic background. The teachers' classes were of comparable size. The classes were operating as a part of a Head Start program sponsored by the OEO under auspices of the local school system.

Procedure

The general procedure for both teachers included conditions of Baseline, Training to attend to desirable child responses, and Probe (or post-test). Baseline condition consisted of recording teacher behavior as it normally occurred. The Training condition consisted of 2 phases of giving feedback to the teacher concerning her behavior.

Phase I - number of appropriate child responses attended to in a 10 minute block
Phase II- Phase I plus frequency of unattended appropriate child responses.

The Probe condition consisted of recording behavior under similar conditions as Baseline, but after the training was completed.

A baseline of eight days was recorded for each teacher two weeks after the classes opened. Teacher A, having the lower rate of attending to appropriate child responses, was selected to be trained initially. During the Training condition for Teacher A, Teacher B served as a control subject. Her behavior during the control period indicated she could profit from training; thus she was then shifted to an experimental program and training was initiated.

Procedure for Teacher A

After baseline data were obtained the training condition began. Teacher A was told that the investigators wanted to find out what teachers do when they are attending to children. The procedure then explained to her was to have someone observe her and to report to her every 10 minutes the frequency of her appropriate attending. Examples of children's appropriate responses were cited. She was shown her baseline graph and was told that there was no criterion to reach, but that the investigators expected to find out what amount of time teachers could attend to appropriate child responses.

The trainer observed and recorded behavior of Teacher A two days a week, alternating days between Teacher A and Teacher B. At the end of every ten minutes of observation, feedback was given by telling the teacher the number of times she attended to appropriate child responses during those 10 minutes (Training Phase I). At no time during this study was information given on the teachers' attention to disruptive child responses.

At the end of each day of observation the trainer would tell the teacher her total percentage of attending appropriate child responses that day, and would again define appropriate child responses.

At the end of the 7th Training day (15th day of the study) the trainer began telling the teacher the number of appropriate child responses which were unattended (Training Phase II). This information was given at the end of the day along with the daily percentage. On the 9th Training day (17th day of study) the process of decreasing feedback (fading) was begun: feedback was discontinued at the end of every ten minutes. Between Training days 10 and 13 the trainer stopped giving the frequency of unattended child responses and hypothetical examples of appropriate child responses. On the 13th day of Training the trainer left early (thus giving no daily percentages). The first day after this no-feedback procedure Teacher A asked for her percentage and it was given to her. After this day no further data were given until the end of the study. In all, there were 17 days of Training. One week later an observer recorded attending behavior for a Probe of four days.

Procedure for Teacher B

After the eight days of Baseline, Teacher B was told that another observer (trainer for Teacher A) would be observing her to continue to record her attending behavior. This was explained as a procedure to find out the pattern of teacher's attending behaviors. Teacher B was told that periodically (on a ten minute schedule similar to Teacher A) the observer would ask questions or make comments about a child or about an activity. She was told that communication would be brief requiring a minimal response in order not to interrupt her teaching. This was done to equate the social interaction between trainer and teacher for both teachers and is referred to as "Irrelevant Feedback" for Teacher B in this study.

The two conditions of Baseline (8 days) and "Irrelevant Feedback" (10 days) served as the control conditions for her own behavior under the Training procedure. A Training procedure was initiated for Teacher B on day 19. Feedback was given at the end of every 10 minutes (Phase I). The nature of the verbal interaction between trainer and Teacher B during "Irrelevant Feedback" necessitated a change in how feedback was given during the Training condition. Teacher B was accustomed to talking about a wide range of child behaviors under "Irrelevant Feedback" condition. Therefore a slip of paper with the number of her appropriate attending behaviors written on it was used to focus her directly on the behavior under study. Reports at the end of the day included the percentage of attention to appropriate child behaviors for the day as well as examples of hypothetical appropriate behaviors.

At the end of eight days of Training (26th day of study) the daily report included the frequency of unattended behaviors (Phase II). At the end of 12 days of Training (30th day of study) the 10 minute feedbacks were eliminated to begin the fading procedure. From the 13th to the 17th days information given at the end of the day was decreased using a similar fading procedure as was carried out with Teacher A. The following week the original observer recorded data for a four day Probe.

Instruments

Two observers were trained to observe and record teachers' attending behaviors. Teacher behavior was defined grossly as attending to appropriate child responses (category I) and attending to disruptive child responses (category II). Attending was defined as verbalizing (talking, singing) to a child, displaying facial gestures (smiling, eye contact responded to), and using physical contact (touching, patting).

Attending to appropriate responses was defined as giving attention to a child when he (1) is involved in an activity, (2) follows directions, (3) is involved in group play, (4) initiates adult interactions.

Attending to disruptive responses was defined as giving attention to a child when he (1) physically disturbs another, (2) verbally disturbs another, (3) abuses materials, and (4) does not follow directions.[3]

Behaviors were recorded in 10 second intervals. Data were figured on the bases of percentage of teachers' behaviors emitted during a day.

A third observer (trainer) was trained to observe and record behaviors in category I and to record occurrences of child responses which _could_ have been attended to but which were not.

Reliability of observing was made by having two observers record behaviors simultaneously and aligning the two.[4] Four days of reliability were obtained on each teacher.

"Norm" Teachers

During the training sessions for Teachers A and B two observers recorded behaviors of four teachers with advanced graduate training and several years of experience of working with groups of preschool children. These teachers had also participated in and directed behavior modification studies employing reinforcement techniques. Teachers 1 and 2 taught in a university demonstration school with children from low income districts. These teachers were not informed in detail about the scale on which they were being observed. Teachers 3 and 4 taught in a university laboratory preschool composed of normal middle class children and several teaching assistants giving a low teacher/child ratio. They were familiar with the scale on which they were being observed. The data from these observations were viewed as near-maximum criteria by which to evaluate attending patterns of the subject teachers. Four days of data were obtained on each teacher in their normal preschool setting.

RESULTS

In Figure 1, the average amount of time spent by Teacher A in attending to appropriate child responses was found to be 8% of each session over eight Baseline days.

Insert Figure 1 about here

Teacher B's attending behavior to appropriate child responses was slightly higher, with a baseline average of 14%.

Insert Figure 2 about here

Teacher A, having the lower rate of attending behavior to those child responses defined earlier as "appropriate," was selected as the teacher upon whom the training condition was to first be applied. Teacher B served initially during the Training phase as a control for trainer-teacher interaction.

Teacher A

At the top of Figure 3 the total percent of time the teacher attended to or did not attend to appropriate child responses is plotted for 29 observation days (in two-day blocks except for Day 15) for Baseline, Training, and Probe conditions.

Insert Figure 3 about here

Figure 3 also shows a breakdown of four different child response categories for which teacher attention was observed. These categories are mutually exclusive and contribute to the top graph of total percent of time.

During Baseline Teacher A had an average rate of 2% attending to a child in an activity, 3% to child following directions, 1% to children in group play, and 3% to children's initiations. This made a total average of 8% of attending to appropriate child responses.

After seven days of Training (days 9-15, Training Phase I) Teacher A had an average of 8% attending to a child in an activity, 8% to child following directions, 1% to children in group play, and 6% to children's initiations. This made a total of 23% of attending to appropriate child responses.

The next 10 days (days 16-25, Training Phase II) Teacher A had an average of 15% attending to a child in an activity, 11% to child following directions, 3% to children in group play, and 7% to children's initiations. Her total rate of attending to appropriate child responses for the 10 days averaged 37%. Her total rate of attending to appropriate child behavior for the entire Training period (17 days) was 30%.

Four days (days 26-29) of data were recorded by the Baseline observers for a Probe one week following the Training condition. During the Probe an average of 12% of attending to appropriate child responses was directed to a child in an activity, 13% to child following directions, 3% to group play, and 8% to children's initiations. Total attention given to appropriate child responses average 35% during the Probe.

During the Training condition the trainer was also recording occurrences of appropriate child responses which were not attended to. Figure 1 shows the decrease in occurrences of unattended appropriate child responses. An average of 21% unattended appropriate child responses was recorded during Training Phase I (days 9-15). During Training Phase II (days 16-25) there was an average of 10% unattended appropriate child responses.

Figure 4 shows the percent of attending to disruptive child responses as defined earlier for Teacher A during Baseline, Training, and Probe. On the abscissa are the days on which attention to disruptive child responses was recorded. Teacher B is plotted on the same figure.

Insert Figure 4 about here

During the eight days of Baseline (shown in two-day blocks on Figure 4) Teacher A averaged 9% attending to disruptive child responses.

On the days reliability checks were taken during Training, the baseline observers recorded attention to disruptive child responses. Teacher A showed an average of 5% attending to disruptive child responses for these four days. During the Probe the total attention to disruptive child responses increased slightly to an average of 11%.

The proportion of total attending time directed to attending to appropriate child responses for Teacher A is plotted in Figure 5 for Baseline, Training, and Probe conditions. Teacher B is plotted on the same figure.

Insert Figure 5 about here

Of the total time spent attending to appropriate and disruptive child responses during eight days of Baseline, Teacher A attended to appropriate child responses an average of 51% of that time. During Training attending to appropriate child responses rose to an average of 85% of the total attending time. During the final four days of Probe condition the average attending behavior of Teacher A to appropriate child responses decreased slightly to 76% but remained well above Baseline conditions. In Figure 4 one notes that attending to disruptive child responses remained relatively unchanged during the entire study. The increase in attending behavior of Teacher A occurred in her attending to appropriate child responses, not in her attending to disruptive child responses.

Teacher B

At the top of Figure 6 the total percent of time that the teacher attended to or did not attend to appropriate child responses is plotted for 38 observation days (in two-day blocks) for Baseline, "Irrelevant Feedback", Training, and Probe conditions.

Insert Figure 6 about here

Figure 6 shows also a breakdown of four different child response categories where teacher attention was observed. The top graph represents the total of these four mutually exclusive sub-categories (as was represented in Figure 3 for Teacher A).

During Baseline Teacher B had an average rate of 14% of her time spent in attending to appropriate child responses. She displayed an average of 2% attending to a child in an activity, 3% to a child following directions, 0% to children in group play, and 8% to children's initiations.

Teacher B, during "Irrelevant Feedback" (days 9-18), had an average of 14% attending to appropriate child responses. This was no change at all from her baseline average.

When Training Phase I (days 19-26) was initiated with Teacher B, her average rate of attending appropriate child response rose to 19%. She had an average of 7% attending to a child in an activity, 4% to child following directions, 0% to children in group play, and 6% to children's initiations.

On days 27-34 (Training Phase II when feedback was given relevant to occurrences of unattended appropriate child responses) Teacher B had an average attending rate of 23%. An average of 13% was directed to a child in an activity, 3% to child following directions, 1% to group play, and 9% to children's initiations. Her total average of attending to appropriate child responses during both phases of Training was 21%.

Four days (days 35-38) of data were recorded by the baseline observer for a Probe following Training. During the Probe, Teacher B had an average of 25% attending to appropriate child responses: an average of 5% to a child in an activity, 8% to child following directions, 1% to group play, and 13% to children's initiations.

Occurrences of not attending to appropriate child responses were recorded during "Irrelevant Feedback" (days 9-18). Figure 2 shows an average attending rate of 31% during "Irrelevant Feedback", and a decrease to a 19% average after Training (Phase I) was introduced. During Training Phase II (days 26-34) the average rate of not attending to appropriate child responses continued to decrease to 12%. The total average for the entire Training period (days 19-34) was 16%.

In Figure 4 one observes similar rates of attending to disruptive child responses for Teacher B as for Teacher A. During the eight days of Baseline (shown in two-day blocks) Teacher B had an average of 9% attending to disruptive child responses. On days 12 and 16 (during "Irrelevant Feedback") when reliability checks were taken, her rate of attention to disruptive child responses was 6% and 8% respectively. On days 24 and 31 during Training the rate of attention to disruptive child behaviors was 11% and 7% respectively. During the Probe (days 35-38) Teacher B had an average of 11% attending to disruptive child responses. Both teachers had comparable rates of attending to disruptive child responses and both teachers maintained fairly stable rates throughout the study.

Of the total attending time of Teacher B (attending to appropriate and disruptive child responses) an average of 61% of that time during Baseline was directed to attending to appropriate child responses, as shown in Figure 5. During "Irrelevant Feedback" the average proportion was 69%, during Training 64%. During the four days of Probe the average continued to increase to 72%. As was true for Teacher A, the increase in total attending time was in attending to appropriate child responses, not in attending to disruptive child responses.

Figure 7 shows the percentages of attending to appropriate child responses for four trained and experienced teachers and the two experimental teachers.

Insert Figure 7 about here

Four days of observations were made on the four "norm" teachers. The average percent of attending to appropriate child response for the "norm" teachers 1, 2, 3, and 4 was 49%, 43%, 39%, and 38% respectively. Figure 7 also shows Study Teachers A and B for comparison purposes with the "norm" teachers under Baseline and Probe conditions to show the effects of Training.

Figure 8 shows the percentage of attending to disruptive child responses

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Insert Figure 8 about here

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for the four "norm" teachers and the two experimental teachers. Teacher 1, 2, 3, and 4 show in general a lower percentage of attending to disruptive child responses than Teachers A and B. Teacher attending to disruptive child responses was not modified during this study for Teacher A and B, and the similar curves for Baseline and Probe conditions reflect no change in their behavior in this area. It should be noted that differences between the "norm" and study Teachers in attending to disruptive child responses is not necessarily due to the "type" of children in the classroom since two of the "norm" teachers had children of comparable economic backgrounds and ethnic characteristics.

DISCUSSION

During the condition of "Irrelevant Feedback", Teacher B served as a control for Teacher A (who was undergoing training) and for herself when she subsequently was placed in the Training condition. The fact that Teacher B varied only slightly from her baseline rate of attending to appropriate child responses under "Irrelevant Feedback" conditions while Teacher A made sizeable increases under Training indicates that relevant feedback is effective in altering attending behavior. The fact that Teacher B made subsequent increases under Training conditions over Baseline and "Irrelevant Feedback" conditions also supports the conclusion of the effectiveness of the Training conditions. It appears that social interaction with the trainer by itself does not affect attending behavior. The Trainer was not presented as an evaluating person. However, the nature of the feedback in the "irrelevant Feedback" condition resulted in verbal responses and on occasion initiations from Teacher B. This social attention altered Teacher B's attending behavior very little, if any.

Teacher A made the most dramatic progress. Her rate of attending to appropriate behavior increased immediately when Phase I of Training was begun and when she was given reports every ten minutes. During this time she attended to appropriate child responses 2½ times above the baseline rate. When Phase II of Training was introduced she increased her attending to appropriate child responses to an average of 4 times above the baseline rate. Upon introduction of each phase of Training, Teacher A made immediate increases in her attending to appropriate child responses. One factor which no doubt helped to produce both increases and the pursuant levels of achievement was the display of Teacher A's behavior that could be labeled as exceedingly cooperative.

Under the Phase I of Training, Teacher B increased her rate of attending to appropriate child responses by one-third above her baseline rate. When Phase II of Training was introduced her attending to appropriate child responses increased to a rate which was two-thirds more than the baseline rate. The Trainer reported that upon receiving the written report at the end of the ten minutes Teacher B did not seem to use the information it contained at that time as she would put the note in her pocket or on her desk. Teacher B reported to the investigators that she had kept the notes until the end of the session and looked at the accumulated notes for the day at that time. She had been charting her own daily totals during the training.

It had been hoped that receiving the information immediately would have helped to sensitize the subject to the many occurrences of appropriate child responses. It is possible that reading them collectively at the end of the day may have had a limiting effect on her rate of increase in attending to appropriate child responses. It would appear that immediate feedback is more effective than delayed feedback and that were the study to be replicated again the condition of immediate attention to relevant feedback would be mandatory. However, in both instances the use of information regarding attended appropriate child responses and unattended appropriate child responses were more effective than only information regarding attended appropriate child responses.

The question arises as to whether Teachers A and B increased their total attending rate to both appropriate and disruptive child responses or whether their increase was only with the former. Results seem to indicate that attending behavior did not increase in all areas but only in the area of appropriate child responses--that behavior which was being experimentally modified. This is based on the fact that neither A nor B increased proportionately in attending to disruptive child responses. And further, that Teacher A and B's attention to appropriate child responses increased as the rate of unattended appropriate child responses decreased during the period of training. It has been hoped that a delayed probe could have been made to further clarify the lasting effects of the training, but this proved to be impossible due to the termination of the school year.

The results indicated that both Teachers A and B increased in total attention to appropriate child responses, and further that there are some variations with respect to the sub-categories or areas where their attention increased. For example, Teacher A increased her attending behavior mostly in the category when children were engaging in an activity and also for a child following directions. Teacher B increased most in the former area. However, during Training and during Probe conditions some decrease was noted. This raises the question of the lasting effects of this change for this teacher. The investigators would like to have extended the training time for Teacher B, but due to the approaching end of the school year, it was decided there was not time to prolong Phase II of Training. As a result, fading procedures were introduced somewhat abruptly. Further examination shows that Teacher B made some gains in attending to a child's following of directions and to a child's initiation to her.

In both instances, the experimental teachers made virtually no change in attending to a child while he was participating in group play. This proved also to be true for the "norm" teachers. Discussion with the Observers and Trainer revealed that they considered this behavior to occur only when the teacher had spoken to a play group as a whole. If a teacher had commented to one child in that group it was recorded as attending to a child engaged in an activity. The investigators suspect that a different definition of attending to a child participating in a play group would have reflected a higher rate of attending by both "norm" and experimental teachers in this category.

This study presents evidence of a change in teacher's behavior under the procedures discussed. While the purpose of this study did not include a measurement of the children's responses, it might be expected from the use of reinforcement procedures, that an increase in child appropriate responses would occur. That is, when the child emits appropriate responses and there is an increase in the frequency for which this behavior is reinforced (increased teacher attention), then child appropriate responses also increase.

The frequency of total child appropriate responses during Training conditions for Teacher A and "Irrelevant Feedback" and Training conditions for Teacher B can be computed by summing both child appropriate responses attended to by the teacher and child appropriate responses unattended. Using this sum, the children in Teacher A's classroom did not show a noticeable increase in average output of appropriate responses during the Training condition. The children in Teacher B's classroom showed a slight decrease between the "Irrelevant Feedback" and Training conditions. This indicates that at least during Training the children did not increase in their rate of appropriate responses. No specific conclusions can be drawn, however, since this data was not available during Baseline conditions for both teachers so that a comparison can not be made between Baseline and Training phases of the study. The fact, however, that there was no increase in child appropriate responses during Training in either group raises an issue which warrants some consideration.

Several studies (Terrell, Durkin, and Wiesley, 1959; Zigler and de Labry, 1962) have noted that the lower class child learns most efficiently under a material class reinforcer while the middle class child functions more effectively under intangible reinforcement conditions. This has been further supported by a recent study carried out in the preschool of the Juniper Gardens Project in Kansas City, Kansas (Risley, 1967). Their findings indicate that there is minimal behavioral change for their preschool children (lower class) when social reinforcement by the teachers is made contingent upon the rate of specific behaviors they are trying to increase. Their most striking effects are obtained when the teacher's social reinforcement is paired with snacks and preschool materials (objects and puzzles normally found in preschool classrooms).

These studies indicate that social reinforcement in the form of teacher attention by itself may have minimal effects on lower class preschool children. It may also account for the lack of change in appropriate child behavior during the Training condition in this study. Further studies in the area of teacher training where the teacher's classrooms are composed of lower class children seems warranted. Perhaps teachers of this population need to be trained to not only increase their rate of attending to appropriate child responses but to utilize the materials existing in the classrooms as reinforcers for desired behavior.

The data show that a simple but consistent training procedure can be effective in modifying teacher behavior in attending to children. Modification was effected when feedback was relevant indicating that social attention by itself did not produce modification of teacher attending behavior. Furthermore there is evidence that relevant feedback consisting of information about both attended appropriate child responses and unattended appropriate child responses are more effective in training teachers than information about attended child responses by itself. Finally, there is evidence that the resultant modification represents increased activity in attending to appropriate child responses and does not reflect a higher rate of attending to all child responses in general.

There are, then, some implications for training teachers. First, this procedure could be used to sensitize teachers to the occurrence of many child responses and to train them to attend to it. This fact would suggest that it might also be used to train teachers to ignore specific responses. While the more specific parameters of such a procedure are not known, further investigation might serve to locate more efficient limits as well as essentials in using it. Secondly, it raises a question of the components of training. This study did not result in an increase of appropriate child responses and was not designed to focus on this aspect. If teachers were trained to discover effective reinforcers for each child as well as to use those reinforcers effectively, an increase of that behavior in every child in that classroom would more likely occur. If refinements and adaptations of this procedure should prove to be effective and efficient, it would seem that a useful means of training persons who work with children to become more discriminating and sensitive teachers could be developed.

11.

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FOOTNOTES

[1] The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C. 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinions or policy of any agency of the United States Government.

[2] We wish to express our thanks to Miss Norma Bush and her teachers for their cooperation during the course of the study. Special appreciation is expressed also to Dr. Barbara Etzel and Dr. Donald Baer of the Department of Human Development at the University of Kansas for their consultation during the study. And finally our thanks to Wallis Henning, Bonnie Flemming, and Shirley Gerstenberger for assisting as observers

[3] DETAILED DEFINITIONS OF CATEGORIES I & II

ATTENTION:
1) verbalizing (talking, singing) to a child.
2) displaying facial gestures (smiling, eye contact responded to by the child as an indication of his recognition of her attention)
3) using physical contact (touching, patting, giving help).

CATEGORY I: Adult attending to appropriate responses

1. Giving attention to an individual child when he is in an activity which is ongoing or completed:
    - Ongoing--(Ex.) Teacher comments "What a big house you're building."
    - Completed--after child has completed a picture or puzzle the teacher says, "Fine, you did that all by yourself."
    - Can be a question to child about what he is doing with no response by child.

2. Giving attention to a child when he follows the teacher's directions:
    - Follows teacher's request--to pick up toys, wash hands, rest quietly, etc.
    - Answers teacher's question.

3. Giving attention to a child when he is involved with other children:
    - Playing cooperatively with another child(ren)
    - Sharing materials
    - Following rules of an activity involving other children.

4. Giving attention to a child who directly solicits teacher attention by:
    - Follows teacher around
    - Sits beside her
    - Asks for help
    - Asks questions--begins conversation
    - Asks for teacher time
    - Child is injured but not crying
    - Non-verbal request for physical assistance--extending a foot with shoelace untied or handing her a piece of clothing or equipment.

CATEGORY II: Adult attending to disruptive responses

1. Giving attention to a child when he physically disturbs another:
    - . Hitting
    - . Fighting
    - . Crying

2. Giving attention to a child when he verbally disturbs another:
    - . Arguing
    - . Teasing
    - . Responding incorrectly to a question
    - . Swearing or using socially unapproved language.

3. Giving attention to a child when he abuses materials:
    - . Throwing blocks
    - . Climbing shelves
    - . Using materials in an incorrect (to the teacher) manner
    - . Running or jumping on equipment not designed for such activity

4. Giving attention to a child when he does not follow teacher's direction.

[4] The formula used for calculating percentage observer agreement was: [# agreements / (# agreements + # disagreements)] X 100. An agreement was defined as the simultaneous recording of a response by both Observers either in the same interval or adjacent intervals. Otherwise, a disagreement was scored. The percent agreement for Teacher A during Baseline was 92% and during Training 87%, 90%, 73%, 84%. The percent agreement for Teacher B during "Irrelevant Feedback" was 95% and 89%, during Training 76% and 93%.

Figure 1. Behavior curves are graphed under three experimental phases specified above the chart for Teacher A whose attending behavior was being modified. Occurrences of unattended appropriate child responses are graphed under Training phases. The Training phase is broken at the point where the teacher received feedback relevant to occurrences of unattended responses.

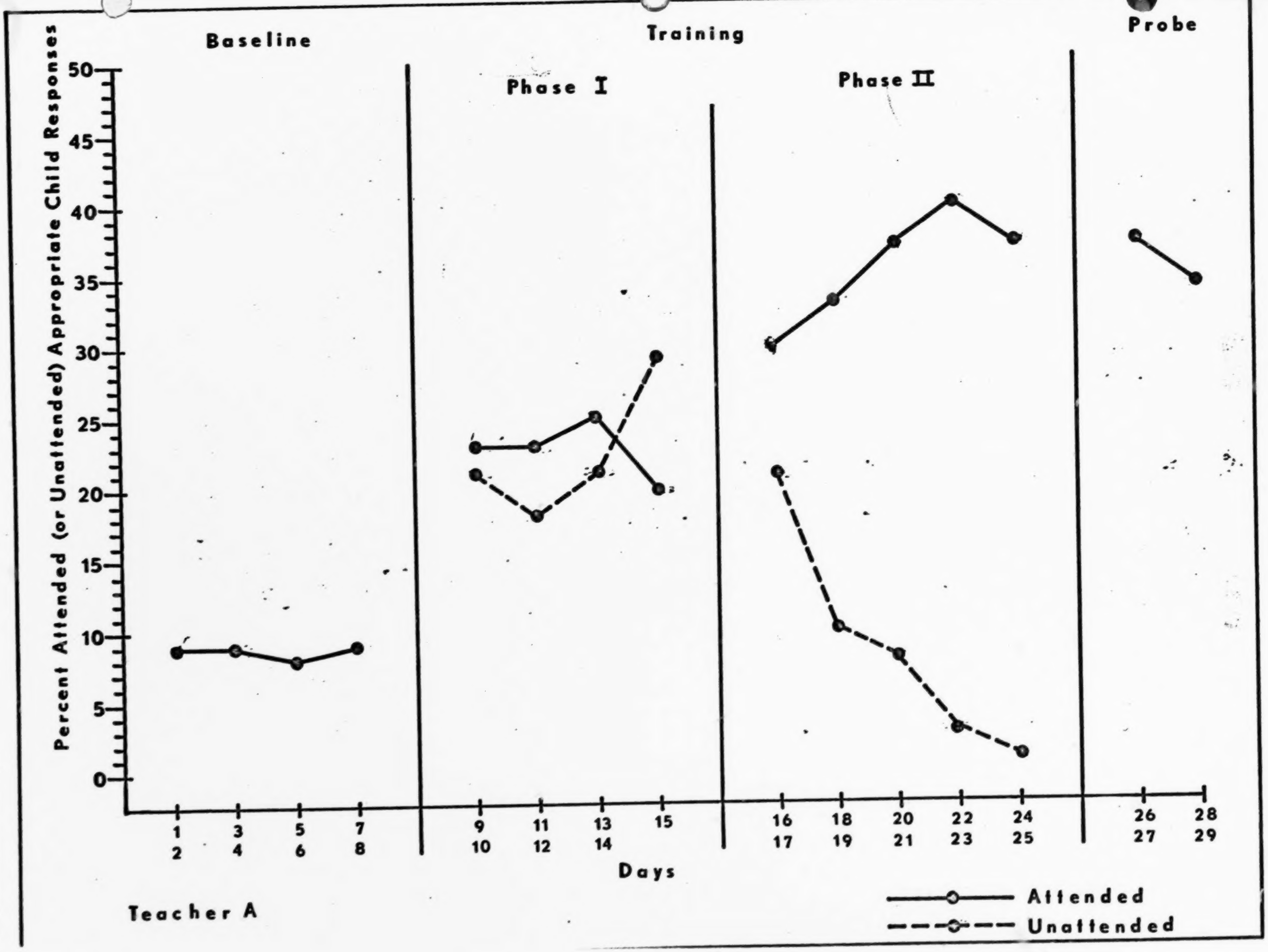

Baseline
Training
Probe
Phase I
Phase II
Percent Attended (or Unattended) Appropriate Child Responses
0
5
10
15
20
25
30
35
40
45
50
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15
16 17
18 19
20 21
22 23
24 25
26 27
28 29
Days
Attended
Unattended
Teacher A

Figure 2. Attending to appropriate child response curves are graphed under four experimental phases specified above the chart for Teacher B whose attending behavior was being modified. Occurrences of unattended appropriate responses are graphed under phases of "Irrelevant Feedback" and Training. The Training condition is broken at the point where the teacher received feedback relevant to occurrences of unattended responses.

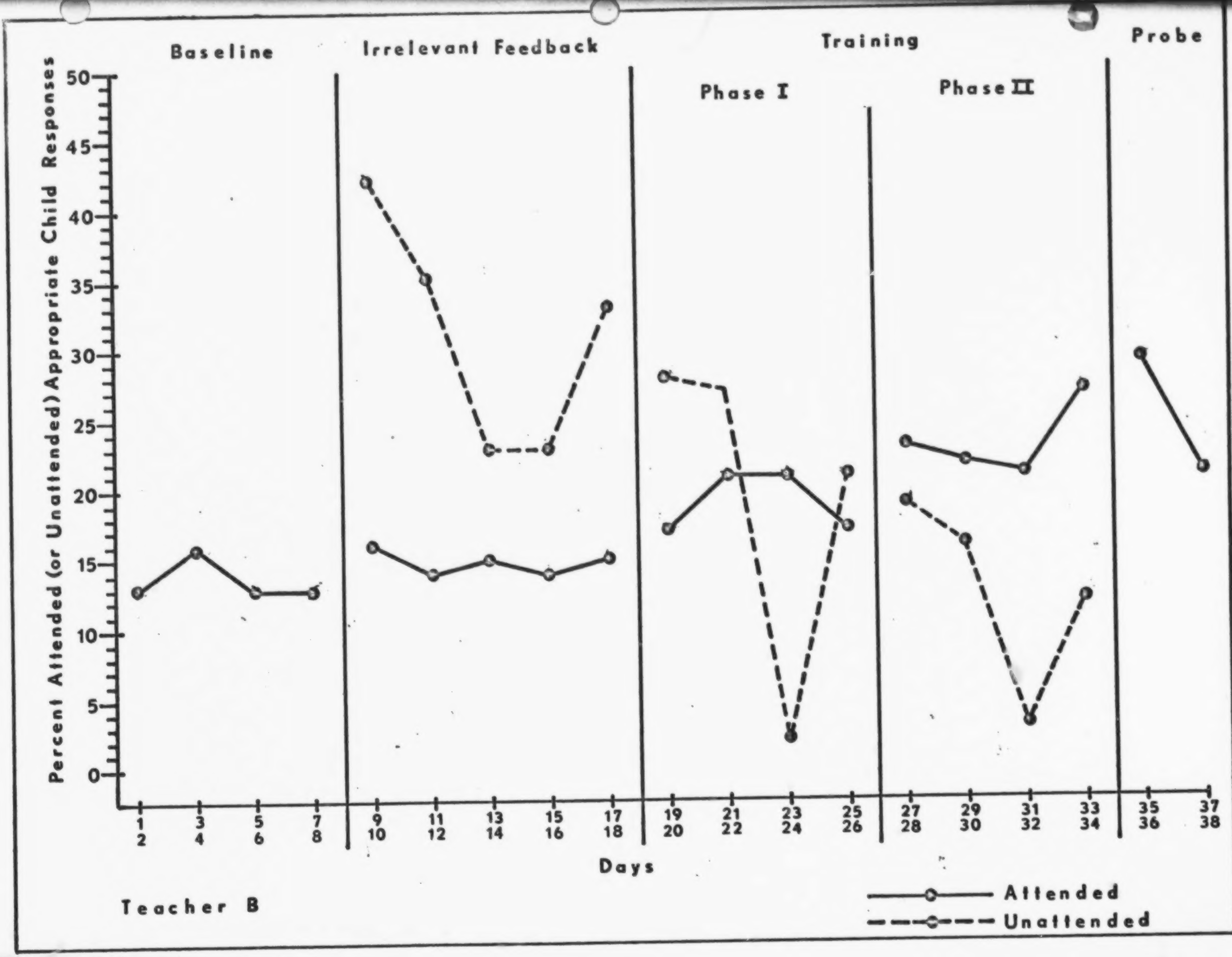

Baseline
Irrelevant Feedback
Training
Phase I
Phase II
Probe
Percent Attended (or Unattended) Appropriate Child Responses
0
5
10
15
20
25
30
35
40
45
50
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
27 28
29 30
31 32
33 34
35 36
37 38
Days
Teacher B
Attended
Unattended

Figure 3. Four concurrent response (and the total) curves are graphed under the three experimental phases specified above the chart for Teacher A. Occurrences of unattended appropriate responses are graphed under the Training condition (Phase I and II).

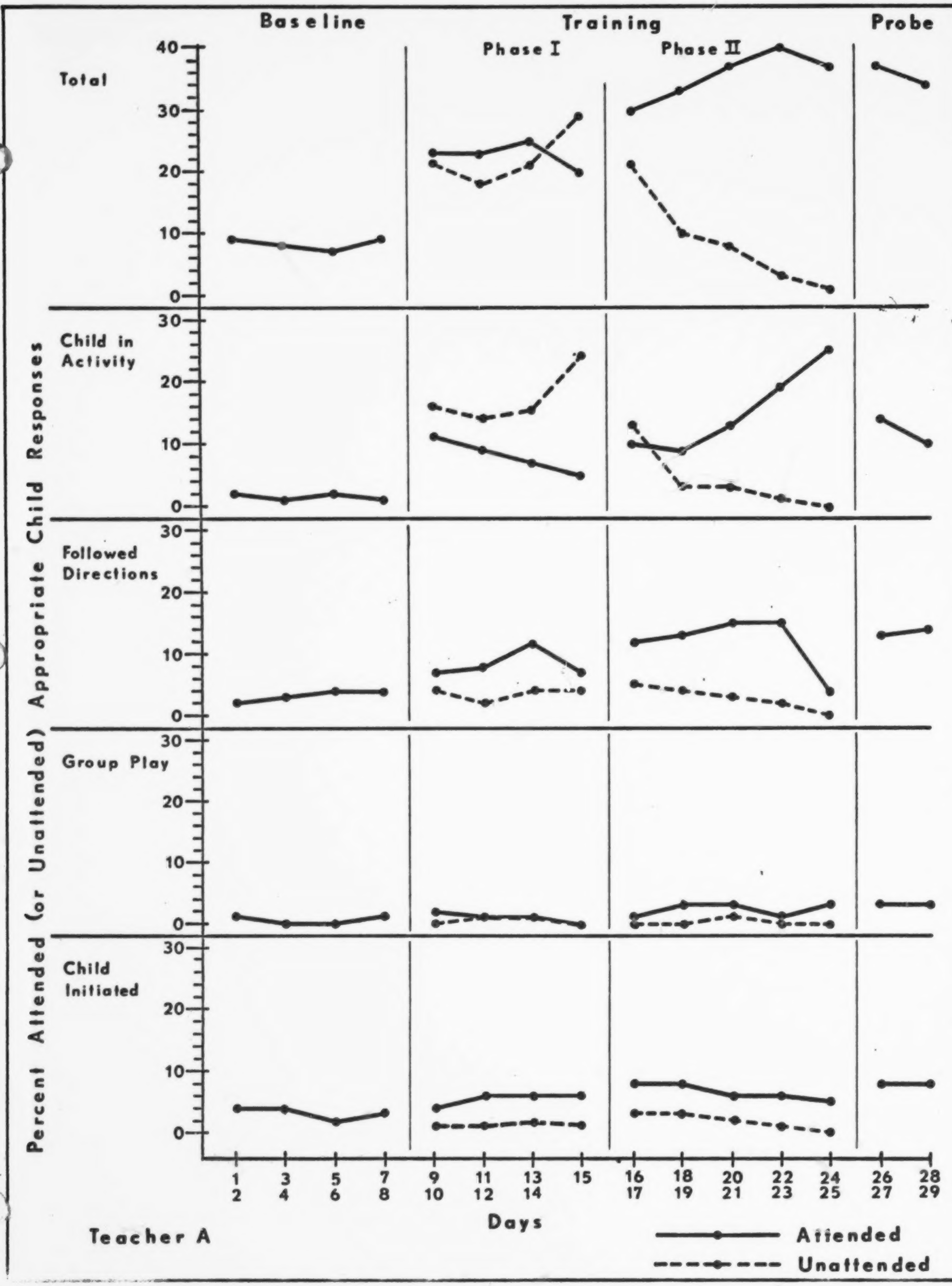

Baseline
Training
Probe
Phase I
Phase II
Total
Child in Activity
Followed Directions
Group Play
Child Initiated
Percent Attended (or Unattended) Appropriate Child Responses
0
10
20
30
40
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15
16 17
18 19
20 21
22 23
24 25
26 27
28 29
Days
Teacher A
Attended
Unattended

Figure 4. Behavior curves of attending to disruptive child responses are graphed under three and four experimental conditions as specified above the chart for Teacher A and B respectively. Baseline and Probe points represent two-day blocks for both teachers. Other points represent single observation days for both teachers.

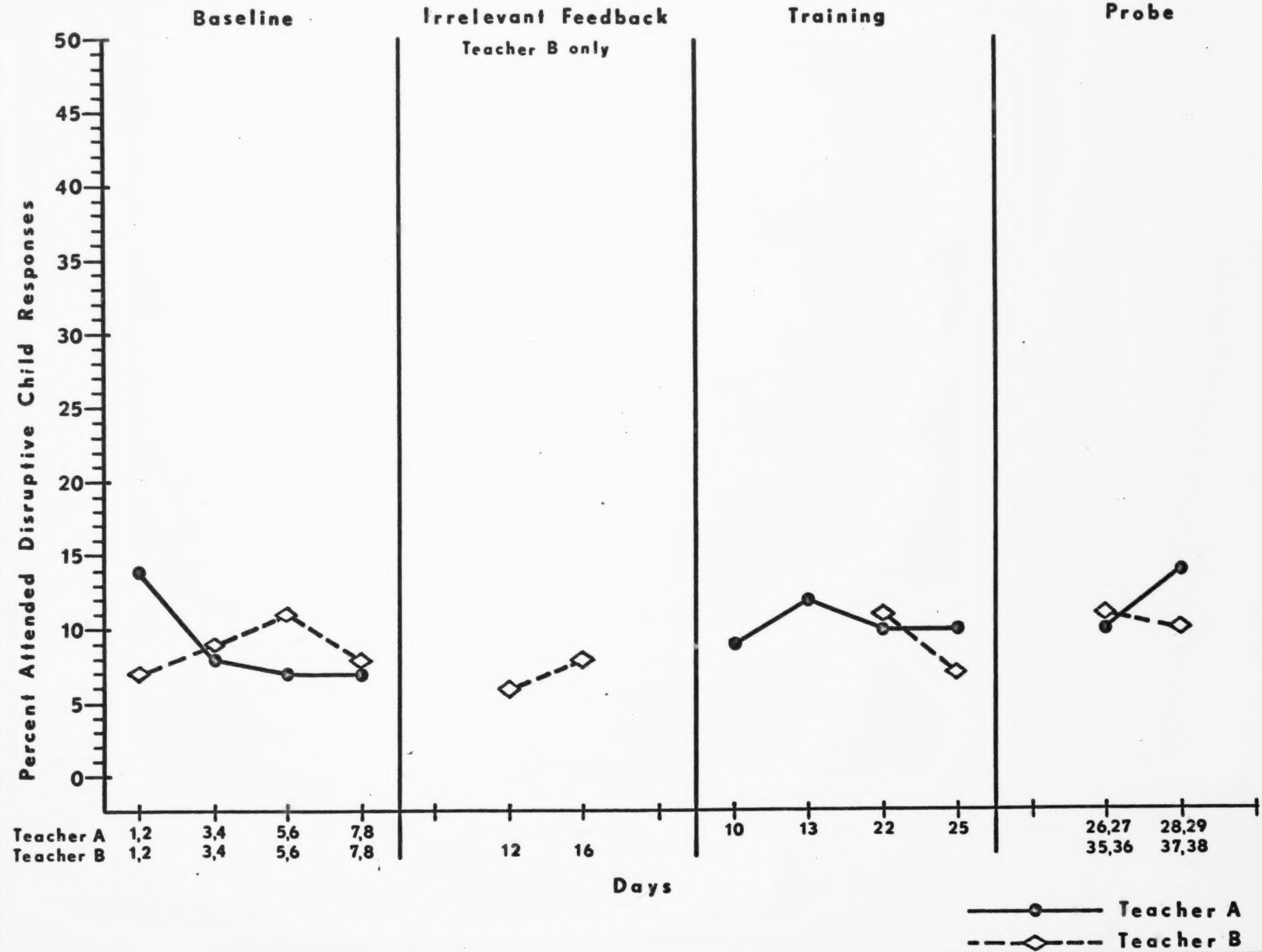

Baseline
Irrelevant Feedback
Teacher B only
Training
Probe
Percent Attended Disruptive Child Responses
50
45
40
35
30
25
20
15
10
5
0
Teacher A
Teacher B
1,2
1,2
3,4
3,4
5,6
5,6
7,8
7,8
12
16
10
13
22
25
26,27
35,36
28,29
37,38
Days
Teacher A
Teacher B

Figure 5. Attending to appropriate child response curves are graphed under the three and four experimental conditions specified above the chart for Teachers A and B respectively. The percentage is based on the total attention directed to both appropriate and disruptive child responses. Baseline for both Teachers is graphed in two-day blocks. Other points represent single observation days.

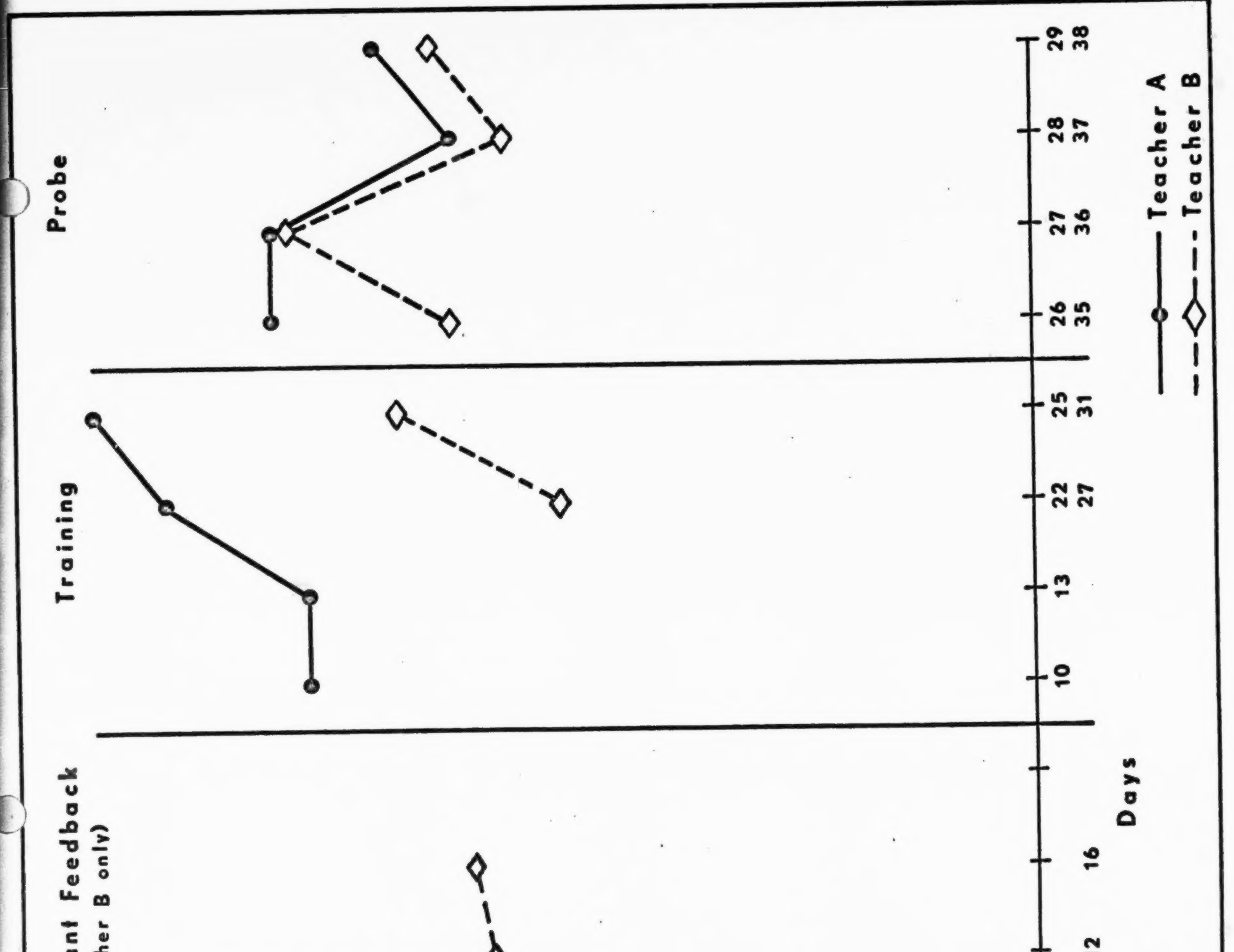

Baseline
Irrelevant Feedback
(Teacher B only)
Training
Probe
Percent Total Teacher Attention to Appropriate Child Responses
90
80
70
60
50
40
0
Teacher A
Teacher B
1,2
1,2
3,4
3,4
5,6
5,6
7,8
7,8
12
16
10
13
22
27
25
31
26
35
27
36
28
37
29
38
Days
Teacher A
Teacher B

Figure 6. Four concurrent response (and the total) curves are graphed under the four experimental phases specified above the chart for Teacher B. Occurrences of unattended appropriate child responses are graphed under the Training condition (Phase I, II).

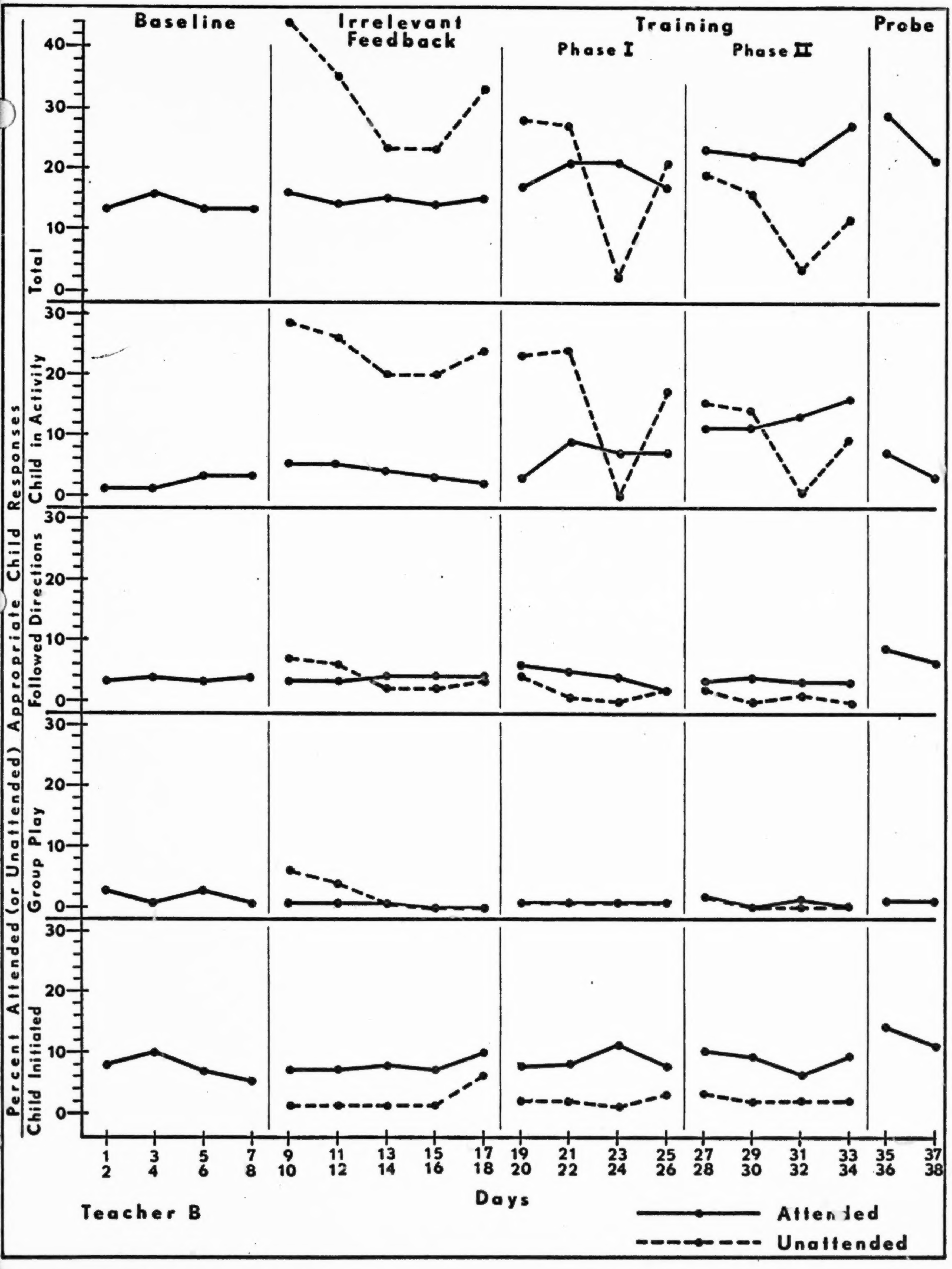

Baseline
Irrelevant Feedback
Training
Phase I
Phase II
Probe
Total
Child in Activity
Followed Directions
Group Play
Child Initiated
Percent Attended (or Unattended) Appropriate Child Responses
0
10
20
30
40
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
27 28
29 30
31 32
33 34
35 36
37 38
Days
Teacher B
Attended
Unattended

Figure 7. Four concurrent response (and the total) curves are graphed for the four normative teachers and two experimental teachers. Curves for Teachers A and B represent Baseline and Probe experimental phases. Baseline curves are graphed by two-day blocks for Teachers A and B. All other points are single observation days.

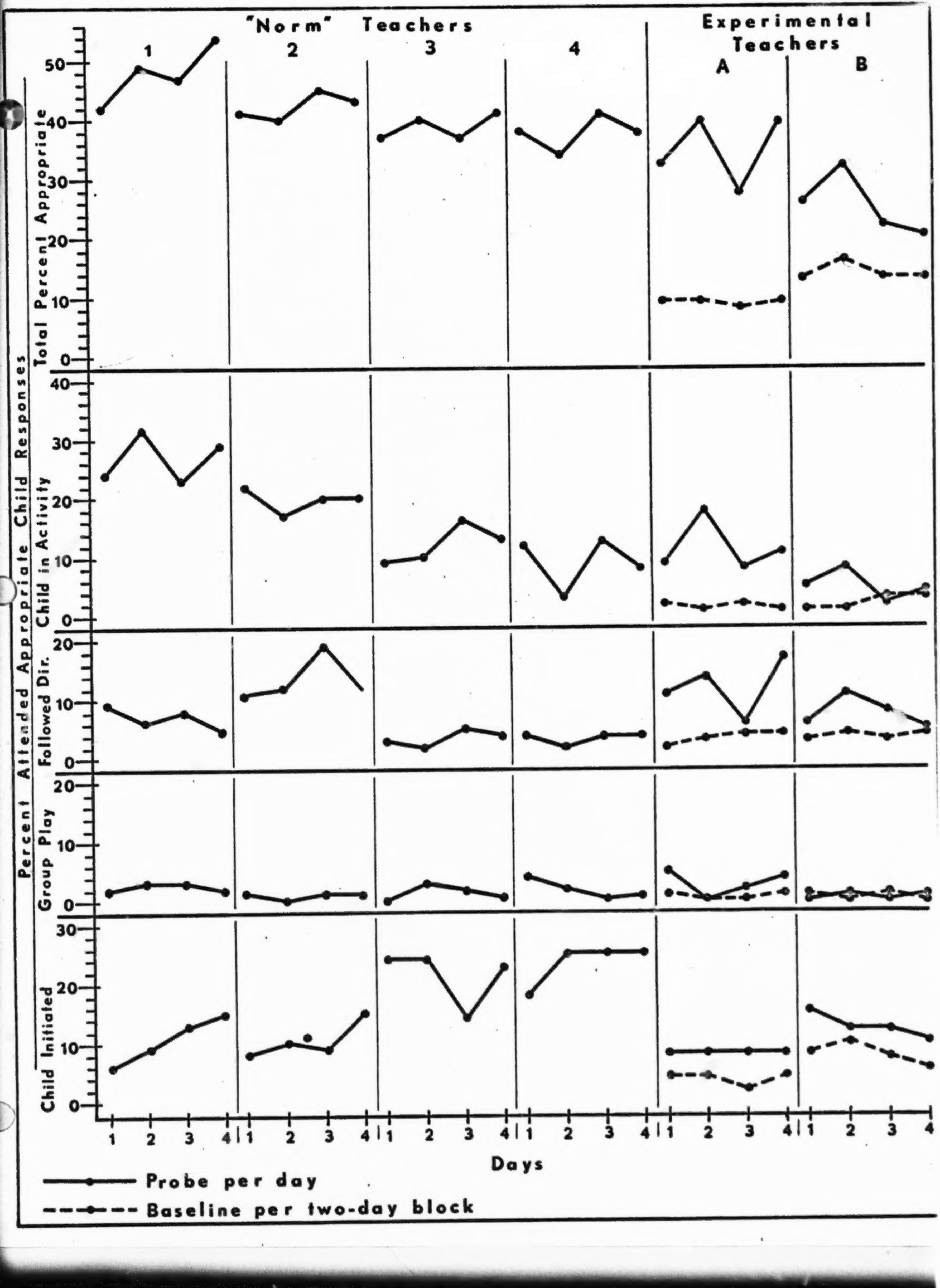
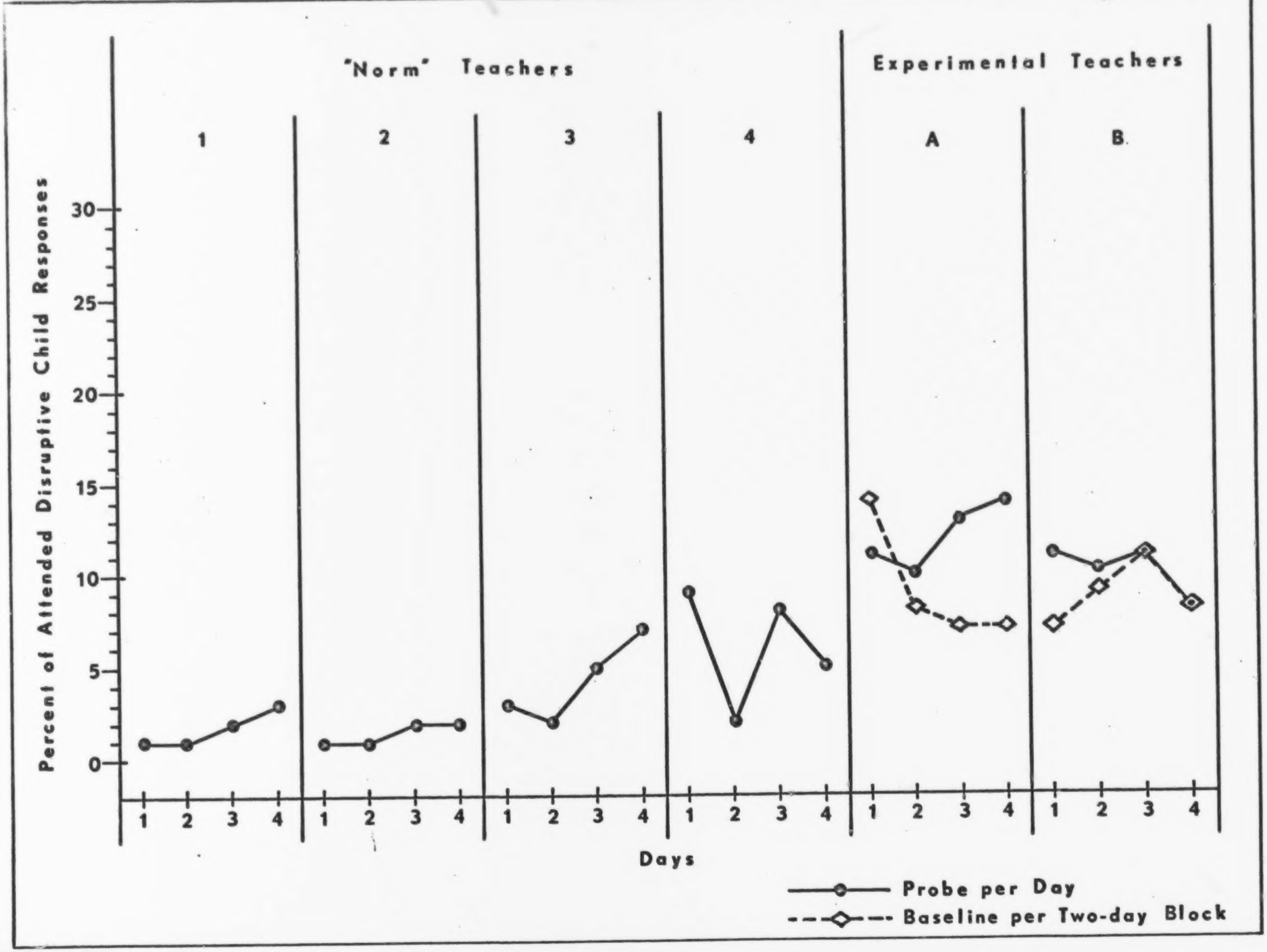

"Norm" Teachers
1
2
3
4
Experimental Teachers
A
B
Percent Attended Appropriate Child Responses
Total Percent Appropriate
Child in Activity
Followed Dir.
Group Play
Child Initiated
0
10
20
30
40
50
1
2
3
4
Days
Probe per day
Baseline per two-day block

Figure 8. Behavior curves of attending to disruptive child responses are graphed for four normative teachers and two experimental teachers. Curves for Teachers A and B represent Baseline and Probe experimental phases. Baseline curves are graphed by two-day blocks for Teachers A and B. All other points are single observation days.


"Norm" Teachers
Experimental Teachers
1
2
3
4
A
B.
Percent of Attended Disruptive Child Responses
30
25
20
15
10
5
0
1 2 3 4
Days
Probe per Day
Baseline per Two-day Block

The University of Kansas Head Start Evaluation and Research Center

II.

"An Investigation of Three Procedures for Modifying the Topography of Verbal Responses."

Thomas A. Brigham, B.S.

Department of Human Development

The University of Kansas Head Start Research and Evaluation Center

II A

"A Study of Auditory Discrimination and Verbal Responding"

Thomas A. Brigham

Department of Human Development

A Study of Auditory Discrimination and Verbal Responding[1]

Thomas A. Brigham
Department of Human Development
University of Kansas

ABSTRACT

Running Head: Auditory Discrimination and Verbal Responding

A single female S was taught to discriminate auditorially between her incorrect verbal responses and the correct pronunciation of those sounds. The method was to pair the auditory stimuli with visual stimuli and then fade out the visual stimuli. The descriminative training had little effect on the child's verbal responses.

A study of Auditory Discrimination and Verbal Responding

Thomas A. Brigham
Department of Human Development
University of Kansas

A widely held hypothesis in the area of speech therapy is that teaching a child who has a speech problem with no organic involvement to hear the difference between the correct pronunciation of a word and his pronunciation will inable him to produce the correct sound. An analysis of problems in pronunciation based on the operant literature would indicate that while the ability to discriminate between sounds is important, it should not be sufficient to correct the speech problem. However, the evidence dealing directly with the problem of whether discriminative training is sufficient to produce the desired change in a subject"s behavior is some what contradictory. Winitz and Preisler (1965) found that after discriminative training a high per centage of their subjects could correctly pronounce a word which they had been unable to pronounce before training. On the negative side, Lane and Schneider (1963) compared a series of methods of producing changes in the pronunciation of a single second language sound. They found that teaching the subjects to discriminate between the correct sound, a Thai Kā, and variations of this sound had no effect on the subjects' ability to produce the correct sound. A third study (Pinsleur 1963) dealing the problem of effects the same problem reported mixed results depending on the sounds being used as the stimuli. The main object of the present study was to examine the effects of extensive discrimination training on the speech problem of a four year old child.

A second concern of the study was the examination of the procedures used to produce an auditory same-different discrimination from a visual same-different discrimination. Fading procedures, similar to those used by Moore and Goldiamond (1964), were used to transfer the control of the discrimination from the visual stimulus complex to the auditory stimulus complex while eliminating the visual stimuli.

METHOD

Subject

The subject of this study was a four year old female child who was attending a preschool ran by the Department of Human Denelopment at the University of Kansas. This child had a variety of speech articulation and pronunciation problems. However, the major characteristic of her speech was that she consistently used inappropriate first consonant sounds such as "gog" for "dog" and "tat" for "cat".

Procedure

The training was conducted 4 days a week Monday through Thursday in the afternoon. Each session lasted approximately 20 minutes.

Reinforcement procedures

A variety of reinforcement procedures were used in an effort to maintain good control over the S's responding. The S was reinforced with pennies on a crf schedule for correct responses in sessions 1 through 10. The mother agreed to take the child to the store after the daily session so that she could spend her money. In sessions 8, 9, and 10 the child did not appear to be closily attending to the stimuli so the reinforcement procedure was modified slightly. Beginning in session 11 and continuing through session 22, the S was given a penny for each correct response but lost one for each incorrect response.

The S's performance began deteriorating again in sessions 16 through 22, and she was reluctant to come in to the experimental setting. It was found that the mother was no longer taking the child to spend her money. Another change was made in the reinforcement procedures. To remove the inconvenience of the mother taking the child to the store, the child was reinforced with poker chips for correct responses during the session, and immediately afterwards she could trade them for toys and candy. The prices for the candy and toys ranged from 1 token for a piece of candy to 15 tokens for the largest toys. In this manner better performances were paid off at differential rates. This procedure was used for the remainder of the experiment.

Pre discrimination training test of the S's verbal behavior

In order to ascertain the exact nature of the S's speech problems 3 sessions were used to investigate what the S actually said for such words as dog, cat, etc. The child was shown a series of 45 pictures, 15 each session and asked to name them. After the S answered, the E gave the correct pronunciation and asked the S to repeat it. Each picture was presented 3 times in an unsystematic order. The child was reinforced with pennies given for attending to the task and for obeying the E instructions.

Thirteen of the 45 stimulus words to which the S gave consistent incorrect responses were selected to be used as stimuli for the auditory discrimination training. The stimulus words were selected on the basis of analysing tape recordings of the sessions. The types of errors selected wrre those which could be easily discriminated and scored. In 12 of the 13 words selected, the error was a consistent and clear inappropriate first sound, such as "gog" for "dog". The last stimulus word selected was rooster for which the S consistently said "rooker". Again, the error is a single inappropriate sound.

Test of auditory same-different discrimination

The S was given a pair of sounds such as "car"-"gar" by the E and asked if they were the same or different. The S was reinforced for correctly identifying whether the sounds were the same or different. The stimulus pairs used in this procedure were selected on the basis of the child's performance in the pre training procedure. The stimulus pairs were made up of the correct pronunciation and the response that the S consistently made to the picture. The auditory stimulus pairs used during this procedure, the visual and auditory same-different procedure, the visual and auditory same-different fading procedure, and the post training prodedure are summarized in Table 1.

Insert Table 1 here

Visual match to sample

The first four days of the discrimination training consisted of modifications of a visual match to sample procedure. In sessions 4 and 5, the S was presented a stimulus complex on a single card, and told to look at it. Next two maor stimulus cards were presented on either side of the first, and the S was asked to point to the one which matched the one in the middle. When the child responded correctly, she was immediately reinforced and told yes those two are the same. If she responded incorrectly, she was told that those two cards were not the same but the other two cards were the same. Then the next set of cards were presented. The first stimuli were simple geometric shapes such as squares, triangles, and circles. The complexity of the stimuli was gradually increased through the series until at the end of session 5 the stimuli consisted of variations in 3 elements on each card such as 121, 123, 123. In session 6, the S was asked to point to the card that did not match the card in the middle. The S was given a variable task in session 7 being asked on a random basis to point to either the match or the mismatch. The stimuli used in sessions 6 and 7 were a composite of the stimuli from sessions 4 and 5.

Visual same-different

In sessions 8 through 11, the S was presented two stimulus cards which may have had the same or different stimulus complexs on them. The S was then asked if the two cards were the same or different. If the child responded correctly the E told her that was right, they were the same, or different, and gave her the reinforcer. If she responded incorrectly, she was told that she was wrong, and the E explained why her answer was wrong. A similar correction procedure was used during the rest of the experiment. Again the initial stimuli were simple geometric shapes, but they were rapidly increased in complexity until at the end of session 9 the stimuli consisted of visual representations of the pairs of stimulus words used during the auditory discrimination test.

Visual and auditory same-difference

The next step in the discrimination training was to pair the visual stimuli with the sounds they represented. The S was presented pairs of stimulus cards which consisted of the visual representations of the auditory discrimination stimuli. As each stimulus card was presented the E pronounced the stimulus loudly and clearly. Again the S was asked if the stimuli were the same or different. An example of this procedure would be the stimulus pair "dog" - "gog". The card dog would be presented and the E would say, "This says dog." Next the card gog would be presented, the E would say, "This says gog.", and ask the S if they looked and sounded the same or different.

Auditory discrimination probe

In order to find out if the training so far had been successful in developing an auditory same-different discrimination, the S was presented the stimuli from session 1 in exactly the same manner.

Visual and auditory same-different (fading the visual stimulus)

The procedures used in sessions 16 through 25 were similar to those for sessions 12, 13, and 14 woth two major differences. First, the stimuli were presented on a single card, one printed on the upper half of the card and the other on the lower half. Secondly, beginning with session 17, a fading procedure was used to eliminate the visual stimuli and transfer the control of the discrimination to the auditory stimuli. The fading was done along two dimensions, the darkness of the stimulus figure and the completeness of the stimulus figure. The darkness of the stimulus was faded by changing from making the stimulus with a black marking pen to a black felt tip pen to a black ball point pen to a number 2 drawing pencil. The completeness of the stimulus was manipulated by introducing gaps into the letters so that they were made up of dashes. The gaps were gradually lengthened, the dashes shortened until the stimulus consisted of a series of light dots. In session 25, the visual stimuli had been faded to the point where several adults were unable to make the discrimination on the basis of the visual stimuli. Beginning in session 21, the E asked the S only if the stimuli sounded the same or different.

Auditory same-different

The visual stimuli were completely eliminated, and the S was presented only auditory stimuli. The S was presented the same stimulus pairs that were used in the initial test of auditory discrimination plus a set based on 3 other words to test for generalization. The stimulus pairs were presented in exactly the same manner as in the test of auditory same-different discrimination procedure.

Post discrimination training test of S's verbal behavior

The S was given two sessions of post training testing to ascertain what effect the ability to discriminate between correct and incorrect pronunciation had on the S's verbal responses. The S was presented the pictures of the 13 stimulus pairs used in the final auditory same-different procedure. The procedure was exactly the same as that used in the pre test with the exception of the changes in the reinforcement procedure which were outlined in the reinforcement section.. Pinsleur (1963) analysed his results on the basis of a distinction between discrimination and differentiation. He felt that the cases where the discrimination training was effective, the subjects had the ability to produce the correct sound and the discrimination training merely taught them when to produce it. On the other hand, where the training was ineffective, he felt that it was because the subjects did not have the motor skills necessary to produce that sound. Further, he concluded that the discriminative training which did not operate directly on the subjects motor skills was not sufficient to produce the ability to emitt that sound. This is an appealing hypothesis which may account for the variation in the findings of the Land and Schneider (1963) and Winitz and Preisler (1965) unfortunately, it can not be applied unmodified to the results of the present study. At various times through out the experiment the subject displayed the ability to produce all of the speech sounds that were involved in the discrimination training. The most striking example of this was the consonant sound, "g" which the subject used often and with great accuracy except when the stimulus was "goat" at which time she generally emitted the consonant, "k". It may be that the explanation of the differences in results may be due to a possibly crucial difference between the subject populations of the two studies. Pinsleur's subjects were students in a high school French class; while the subject of this study was a four year old child with a wide variety of speech problems. It is likely that we may make an assumption about the behavior of the high school French students which we might not be able to make about this subject, that is, that the behavior of improving French pronunciation was under good reinforcement control. These subjects probably had a long history of "good" classroom behaviors producing reinforcement ie. good grades. It is unlikely that a similar statement about the reinforcement control of improved pronunciation might be made about this subject. Perhaps if this subject's speech were brought under similar reinforcement control, then the discrimination training might have produced the desired results. However, in and of itself discrimination training had little effect on the verbal behavior of this child.

RESULTS AND DISCUSSION

Comparing the scores of the first 3 auditory discrimination sessions with those for the last 3 auditory discrimination sessions shows the improvement in the child's ability to descriminate auditorially between her response and the correct response. At the beginning the discrimination training, the child was responding at chance level on this task; after the discrimination training, the S could accurately tell the difference between her response and the correct pronunciation.

Insert fig. 1 (the graph)

However, this descriminative ability had little effect on her verbal responses. Her responses to the pictures in the post discrimination test remained essentially the same in respect to the inappropriate sounds being measured, as the responses in the pre discrimination with the single exception of the word lamb. The S's initial response to the picture of a lamb was amb. After the discrimination training, she did pronounce lamb correctly. A comparison of the results of the pre-discrimination test with the results of the post-discrimination test is presented in Table 2.

Insert Table 2 here

The difficulty in finding an effective reinforcement procedure made impossible an analysis of which parts of the discrimination procedures were essential to the final development of the child's ability to discriminate between the auditory stimuli. It is likely that the match to sample procedure could have been eliminated with little detramental effect since the scores on it were all fairly high, and the results of the auditory probe showed the S had made no improvement in auditory discrimination to that point.

It was not possible to tell whether the low scores in sessions 19 through 22 were due to reinforcement problems or a function of poor stimulus programming. Further since both the darkness and the completeness of the visual stimuli were faded together an analysis of whether both operations were necessary was not possible. It is likely that the procedures could have been made much shorter and faster without losing any of their effectiveness.

While there was some difficulty in analysing which parts of the results could be attributed to what factors in the procedures, the overall procedure was clearly successful. The child learned the auditory discrimination, and her performance in other preschool tasks indicated that she had learned a valuable generalized same-different concept.

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Table 1

Stimulus pairs selected from pre discrimination training test.

Correct	S's response
1. Cat	Tat
2. Doll	Goll
3. Kite	Gite
4. Top	Cop
5. Dog	Gog
6. Lamb	Amb
7. Duck	Guck
8. Boat	Coat
9. Swing	Twing
10. Car	Gar
11. Goat	Coat
12. Rooster	Rooker
13. Calf	Taff

There are 4 possible combinations of each stimulus pair, Top-Top, Cop-Top, Cop-Cop, and Top-Cop. All 4 combinations were used in each session that a particular stimulus pair was used to avoid any biasing of the results.

Combinations of the first 10 stimulus pairs were used 4 in each session during the discrimination training procedures and the last 3 stimulus pairs were used in sessions 27, 28, and 29 to test for generalization.

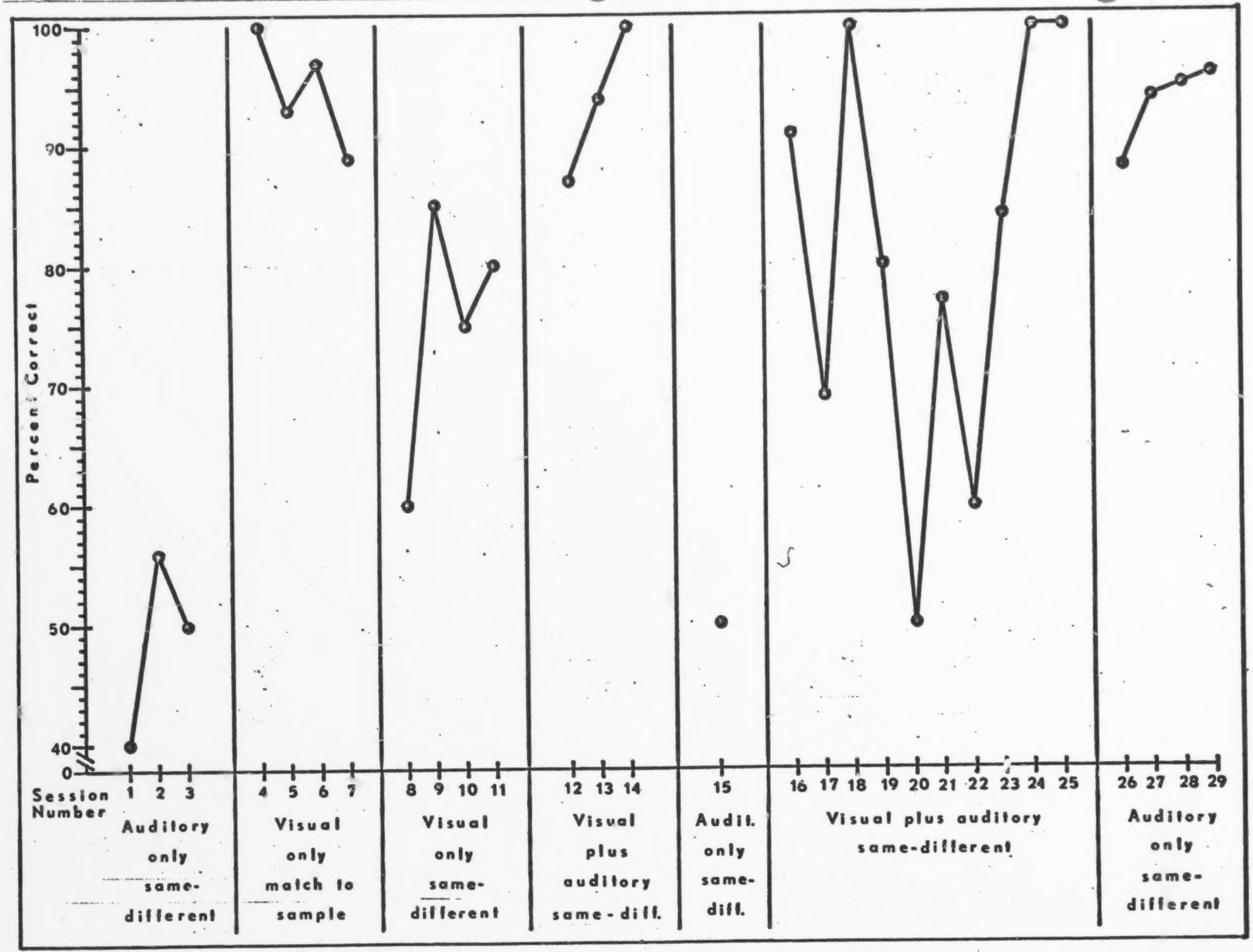
Table 2

Prediscrimination test

Stimulus picture	Response		
	Trial 1	2	3
cat	tat	tiddy tat	tad
doll	golly	goll	goll
kite	gite	gite	gite
top	cop	cop	cop
dog	goggy	gog	gog
lamb	amb	amm	amba
duck	guck	guck	guck
boat	coat	coat	coat
swing	twing	twing	twing
car	gar	gar	gar
goat	coat	cot	coat
rooster	rooker	rooker	rooker
calf	taff	taffy	taff

Post discrimination training test

Stimulus	Response					
	Trial 1	2	3	4	5	6
cat	tat	tiddy	tat	tat	tat	tat
doll	golly	goll	golly	golly	goll	goll
kite	gite	gite	gite	gite	gite	gite
top	cop	gop	cop	cop	cop	cop
dog	gog	goggy	goggy	gog	gog	gog
lamb	lamb	amby	lamb	lamb	lamb	lamb
duck	guck	guck	guck	guck	guck	guck
boat	coat	coat	coat	coat	coat	coat
swing	twing	twing	twing	ping	twing	twing
car	gar	gar	gar	gar	gar	gar
goat	coat	coat	coat	coat	coat	coat
calf	taff	taffy	tafts	taff	taff	taff


Percent Correct
100
90
80
70
60
50
40
0
Session Number
1 2 3
4 5 6 7
8 9 10 11
12 13 14
15
16 17 18 19 20 21 22 23 24 25
26 27 28 29
Auditory only same-different
Visual only match to sample
Visual only same-different
Visual plus auditory same-diff.
Audit. only same-diff.
Visual plus auditory same-different
Auditory only same-different

The University of Kansas Head Start Research and Evaluation Center

II B

"An Experimental Analysis of Verbal Imitation in Preschool Children"

Thomas A. Brigham

Department of Human Development

An Experimental Analysis of Verbal Imitation in Preschool Children[1]

Thomas A. Brigham[2]
Department of Human Development
University of Kansas

ABSTRACT

Running Head: Verbal imitatinn in preschool children

Three preschool children were reinforced for imitating English words presented by a model. The model also presented novel Russian words to the subjects but never reinforced the subjects imitation of these words. When subjects were reinforced for imitating the English words, their accuracy of imitating non-reinforced Russian words increased. When reinforcement was not contingent upon subjects' imitation of English words, accuracy of imitating both the English and the Russian words decreased. These results support and extend previous work on imitative responses.

An Experimental Analysis of Verbal Imitation in Preschool Children

Thomas A. Brigham
Department of Human Development
University of Kansas

Imitation as a class of behaviors has become increasingly important both as a potential method of producing socially significant behavioral changes (Metz 1965; Lovaas, Berberich, Perloff and Schaeffer 1966; Baer, Peterson, and Sherman 1967) and as key concept in theoretical analyses of language development and socialization (Lovaas et al 1966; Bandura and Walters 1964). Recent experimental studies of imitation have produced two consistent findings: If a class of imitative responses is developed in a child, then relatively novel responses can be produced as a result of a demonstration without direct shaping of that response; if some imitative responses directly produce reinforcement, then other imitative responses may be maintatned even though they never directly produce reinforcement (Baer and Sherman 1964; Metz 1965; Lovaas et al 1966; Baer et al 1967).

Lovaas, Berberich, Perloff, and Schaeffer (1966) reported another related finding in the area of verbal imitation beyond that reported in other recent studies of imitation. Their subjects were two autistic children who were taught imitative speech through a long process of imitative training. As an extention of this investigation, they presented the subjects with Norwegian words in addition to the English words to imitate. When these subjects were reinforced for imitating English words, they also attempted to mimic the novel Norwegian words and improved in accuracy of imitation of these words even though there were no programmed consequences for either attempt to mimic or improved accuracy of the Norwegian words.

Since the findings of the Lovaas et al study (1966) have important implications both for theories of language learning and methods of speech therapy, one purpose of this investigation was to replicate the Lovaas et al (1966) experiment with normal children who had not been experimentally exposed to extensive imitative training. A second purpose of this study was to extend the design to contribute additional information about the relationship between reinforcement of some imitative responses and the improvement of other unreinforced imitative responses.

METHOD

Subjects

The subjects were three, four-year old male children of normal mental and physical development. All three children attended a preschool run by the Department of Human Development of the University of Kansas.

Procedure

Training was conducted four days a week in the morning, Monday through Thursday. Each training session lasted approximately 20 minutes. The reinforcers for subject 1 were assorted candies such as M & Ms and afterdinner mints. For subjects 2 and 3, assorted candies were used as rein--forcers in three of the four weekly sessions, and once a week the children were able to earn tokens as reinforcers which they could trade for a toy.

The first session of training consisted of a test to see if the subject imitated the experimenter's verbal cues. The subject was brought into the experimental room and seated at a low table across from the experimenter. The child was told that the experimenter would read a list of words one at a time and that the child could earn candy if he correctly repeated the word after the experimenter said it. The stimulus words for the first session were 115 English nouns of varying complexitysuch as apple, capital, reverse, cartoon, represent, and dog. Each word was presented twice in an unsystematic order. Each time the child correctly reproduced the stimulus word, he was immediately given a consumable reinforcer and also praised for his performance e.g.... If the child failed to correctly repeat the word, nothing was said and the experimenter presented the next stimulus word. The evaluation of whether the subject had correctly produced the English word was based on the experimenter's ability to understand the subject. If the subject's English word was clearly understandable to the experimenter, it was judged correct and reinforced. This allowed for a small amount of variance from an exact pronunciation. For example, a slight ellongation of the last vowel sound in "cartoon: was acceptable, while the substitution of a "g" for the "s" in "represent" was unacceptable. All sessions were tape recorded and the sessions with subject 1 were also recorded by an observer. All the subjects readily imitatid the experimenter's verbal models in the test session and were continued in the program.

Reinforcement for Imitation of English Words

The procedures in sessions two through six for subject 1 and two through five for subjects 2 and 3 were basically the same as those for the first session with two major exceptions. The instructions at the beginning of the sessions were deleted and the subjects were given no further instructions throughout the study. In addition, Russian stimulus words were added. The Russian words were presented in the same manner as the English words, however, the Russian words were never followed by either consumable or social reinforcement. The procedure involving the Russian words was as follows: A Russian word was presented, if the subject responded the experimenter presented a new stimulus word approximately 10 seconds after the subject's response; if the subject did now respond to the Russian word, the next stimulus word was presented approximately 10 seconds after the experimental demonstration. The total number of English and Russian stimulus words was fifteen in sessions two through thirteen for all subjects, with each word being presented twice in a random order. Initially, subject 1 was given three Russian words to imitate, However, in session five, this was increased to five for the rest of the experiment. Subjects 2 and 3 were given four Russian words to imitate in sessions two and three. The number of Russian words presented was five in sessions four through thirteen and six for sessions 14 through 20. The Russian words presented to each subject are summarized session by session in Table 1.

Insert Table 1 here

Reinforcement of Behavior other than Imitation

A schedule of differential reinforcement of other behavior (DRO) for imitation of English words was used in sessions seven through ten an for subject 1, and sessions six through nine for subjects 2 and 3. During the DRO procedure, the subjects were never reinforced for imitating either the English or the Russian words, but were reinforced no sooner than five seconds after their last imitations. That is, the experimenter presented a word to a subject; if the subject imitated it, reinforcement was delivered no sooner than 5 seconds after the response. If the subject did not respond, reinforcement (e.g., candy and "food") was delivered no sooner than 5 seconds after the presentation of the stimulus word.

The DRO period after the subjects response was not measured consistently; the actual time varied between about 5 to 20 seconds with a mean of approximately 10 seconds. After the DRO interval elapsed and before the presentation of the next stimulus word occasionally additional social reinforcers were given to the subject on a non contingent basis.

In the third session of the DRO period for subject 1, a pair of new Russian words was added, replacing two of the old Russian words. A single new Russian word was introduced into the third session of DRO for subjects 2 and 3. The Russian stimulus words added during the DRO are labeled $Russian_2$, and the Russian stimulus words introduced during the initial procedures are labeled $Russian_1$. Since the number of Russian words presented in any one session was held constant, the introduction of the $Russian_2$ words necessitated a reduction in the number of $Russian_1$ words. In order to avoid any biassing of the sample of $Russian_1$ words, all of them were continued as stimuli, and those to be used in any one session were selected on a random basis. This method was used to select the $Russian_1$ words for the remainder of the experiment.

Reinforcement for Imitation of English Words II

After four sessions of the DRO schedule, direct reinforcementof the subject's imitation of English words was reinstated. Again only the imitation of the English words was reinforced, the imitation of the Russian words was never followed by either consumable or social reinforcers.

Pairing of English Words and Reinforcement

Subjects 2 and 3 were run on two additional procedures. One involved the pairing of the English stimulus words and reinforcement, similar to a classical conditioning paradigm. In the stimulus pairing procedure, the experimenter presented the English stimulus word and at the same time delivered a consumable reinforcer to subject. Whether the subject responded correctly, incorrectly, or not at all, the experimenter waited approximately 20 seconds and then presented the next stimulus word. Only the English words were paired with reinforcement; the Russian words were never paired with reinforcement. During the 20 second interval after the consumable reinforcer was delivered and before the next stimulus presentation accasional social reinforcers were given to the subject on a non-contingent basis. Two new Russian words were added during this procedure and were labeled $Russian_3$. The $Russian_2$ words were continued and the $Russian_1$ words presented in any session were selected on a random basis.

Reinforcement for Imitation of English Words III

Contingent reinforcement of correct imitation of the English stimulus words was reinstated. As in the two reinforcement procedures before, the subjects' responses to the Russian words were never followed by either consumable or social reinforcers.

Scoring of Verbal Responses

The data from all of the sessions were tape recorded, with the Russian words analyzed and scored later. The English words were not rescored and the scores presented in the results section are based on the number of English words correctly pronounced divided by the total number presented. Correctness was determined by the method outlined in the preliminary procedure. The scoring of the Russian words was done by two analysts working independently. One analyst scored all of the sessions, the second analyst scored half of the sessions. The sessions scored for analyst reliability were selected at random and represented points where the subjects' imitation was accurate and points where it was inaccurate. The scoring of the Russian words was carried out in a manner similar to that used by Lovaas et al (1966). Each letter pronounced correctly was given one point and each syllable pronounced correctly was given three points; the points were then totaled and divided by the total number of points possible to give a degree of correctness score. In addition, another measure of analyst reliability (right-wrong agreement) was computed/ the analyst's judgements of whether the Russian pronunciation was correct or incorrect were compared. When the two analysts sgreed that a word was either correct or incorrect, it was scored as one point; if they disagreed, it was scored as zero. The total was then divided by the total number of agreements possible to give a right-wrong agreement score for that session. Table 2 contains a list of all the Russian stimulus words used in the experiment, the Russian spelling of each word, the phonetic spelling, and the points assigned to each word.

Insert Table 2 here

RESULTS

The results for the two measures of analyst realiability, right-wrong agreement and degrees of correctness agreement, were consistently high with the mean scores ranging from .90 to .95. The session by session scores for each subject are presented in Table 3. The high scores for analyst reliability over the entire experiment indicate that the changes in the subjects' imitation of the Russian stimulus words were clearly observable and objectively scoreable.

Insert Table 3 here

The overall results of the study are graphically presented in figures 1, 2, and 3, and the session by session scores for each individual Russian stimulus word is presented in Table 4.

Insert Table 4 and Figures 1, 2, and 3 here

While the graphs present a fairly clear picture of the changes in performance over experimental conditions, several points regarding the consistency and nature of the results need explicit statement.

The performances of the subjects over the experiment were very similar. All subjects steadily improved in their pronunciation of the Russian stimulus words during the initial reinforcement period. While the subjects' imitation of English words were scored in a different manner, there was a parallel improvement in their pronunciation of English words.

When the DRO schedule was introduced, there was an immediate decrement in the performances of all subjects on the Russian words. The initial drop was to a point approximately equal to the subjects' scores for imitation of Russian words at the beginning of the first reinforcement period. In the third session of the DRO period, two new Russian words were presented to subject 1 and a single new Russian word was presented to subjects 2 and 3. The scores for the Russian$_2$ words were below the initial scores for Russian$_1$ imitation during the first reinforcement period and also below the scores for the Russian$_1$ words during the third session of the DRO. The English imitation scores for subjects 1 and 3 again closely parallelled their scores for Russian imitation.

When the reinforcement of the imitation of English words was reinstated, there was an immediate improvement in the subjects' imitation of both the English and Russian stinulus words. All subjects again reached a high level of performance on the English and Russian$_1$ words with the scores on the Russian$_2$ words remaining slightly lower.

In the first session of the stimulus pairing the subjects imitation of the Russian$_3$ words added during this session was very accurate and the imitation of the Russian$_1$ words dropped only slightly. However, as the procedure was continued their performances on all Russian words again dropped to a level lower than the preceeding reinforcement period. The imitation of the English stimulus words followed a similar course eventually deteriorating to the lowest level of the entire experiment in the last session of the stimulus pairing procedure.

The second reinstatement of the reinforcement of imitation of English words again resulted in an immediate and pronounced improvement in the subjects' pronunciation of all of the Russian stimulus words. The scores forRussian pronunciation during this prodedure were some of the highest of experiment. Once again, the improvement in the Russian imitation was closely associated with a paralled improvement in the imitation of the English words.

It is important to note that the changes in the scores for the accuracy of imitation from session to session and from procedure to procedure represent a change in the topography of the imitative responses and not a failure to make initative responses. Subjects 1 and 3 made a verbal imitative response after every Russian stimulus presentation throughout the experiment. Subject 2 failed to make an imitative response to the Russian stimulus words twice in session 15 and once in session 17. While these failures to respond were scored as zero for the presentation, if they were left out of the scoring it would not change the basic shape or direction of the curves. Some examples of the decrease in accuracy after very accurate imitation of the same stimulus words are the responses: "topot" for the stimulus word "slovar", "borsha" for "deborchka", and "keyliga" for "kaneega".

DISCUSSION

The results of this study replicate and extend the initial findings of Lovaas ét al (1966) related to improvement in imitation of unreinforced stimulus words. The data from the first reinforcement of imitation of English stimulus words period show a steady improvement in the pronunciation of the Russian stimulus words. But possibly more important for the extension of the findings of Lovaas et al study (1966) to the problem of normal speech development is the fact that the subjects for this experiment were what might be labeled natural speakers. That is to say that the language behavior was the result of processes normally programmed by the environment , and not the result of extensive experimental procedures designed to teach the subjects speech. It is also the case that these subjects were of an age when their vocabulary is rapidly increasing in size and complexity. So the finding that these subjects already possessed extensive imitative skills as data from the imitation of the English stimulus words readily show (their first session scores being 75, 85, and 95 per cent correct respectively) suggests that these imitative skills may be very important in the process or processes of vocabulary elaboration. This possibility is further strengthened by the main findings of the experiment that the subjects improved in their imitation of the Russian words which were never reinforced by the experimenter, indicating that it was not necessary to differentially reinforce every imitative verbal response for it to improve in accuracy. Studies by Baer and Sherman (1964) and Baer, Peterson and Sherman (1967) have also demonstrated that it is possible to maintain imitative responses which were never reinforced as long as some of the subject's imitative responses were reinforced. These studies also found that if the contingent reinforcement of imitation was discontinued for all imitative responses and reinforcement was delivered contingent on the occurence of other responses (a DRO schedule) then the rate and accuracy of all imitative responses decreased. These findings were replicated for the area of verbal imitation in this study. During reinforcement for behavior other than imitation, a similar decrement in the accuracy of both the formerly reinforced and non-reinforced imitative responses was obtained. When the reinforcement of the imitation of the English stimulus words was reinstated, both the reinforced and non-reinforced imitative responses again increased in strength.

The stimulus pairing procedure also involved discontinuing contingent reinforcement of all imitative responses. The data from the last two sessions of this procedure shows a similar decrement in imitative responding. Since the amounts of both social and consumable reinforcers delivered to the subjects remained fairly constant over the experiment, it is probable that the difference in performances were the result of the way in which the reinforcers were delivered. When the experimental procedures and results are looked at together, it appears that, under conditions where some imitative responses are directly reinforced by the experimenter, all imitative responses are strong and increase in accuracy; under conditions where this direct reinforcement was discontinued, all imitative responses appeared weaker and decreased in accuracy.

There are several possible explanations of these results. A number of recent papers on imitation have suggested that the development of non-reinforced imitative behavior can be analysed as a result of the experimentally developed reinforcing properties of behavior similar to a model (Lovaas et al 1966; Baer et al 1967). A corresponding account may be applied to findings of the present study. During the reinforcement of English imitation, the subject was reinforced when his vocal production matched that of the experimenter. Since vocal matching (similar auditory stimuli) preceeded and was discriminative for reinforcement, it may have become a conditioned reinforcer. If that is the case, improvement on the Russian words could have been the function of the differential amounts of conditioned reinforcement involved in closer approximations to a matching vocal response (thus producing more closely matched auditory stimuli). When the relationship between matching vocal productions and reinforcement was withdrawn in the DRO and stimulus pairing procedures, the conditioned reinforcing effects of matching auditory stimuli should decrease, accounting for the decreased accuracy of matching the reinforced Russian words found during these two procedures. However, since the auditory consequences to the subjects of their own vocalizations were not directly manipulated, it is not possible to state definitely that the findings of this study were a result of the indirect manipulation of the conditioned reinforcement value of similarity.

Alternatively, it is also clear from the overall results of this experiment that for these subjects both the imitation of English stimulus words and the imitation of Russian stimulus words belong to the same general response class which may be labelled verbal imitation. This interpretation is based on the fact that all of the experimental operations were carried out on only the imitation of the English stimulus words. The imitation of the Russian words was never directly manipulated. Yet the results show that the Russian imitation covaries with the English imitation and increases or decreases as a function of the operations performed on the English imitation. It seems possible, therefore, that the procedures used in this study functionally reinforced verbal imitation in general rather than imitation of specific words. The maintenance of unreinforced imitations may be accounted for simply as a result of a variable ratio reinforcement schedule for imitation in general and a failure on the subjects' part to discriminate between the English and the Russian stimulus words as being differentially related to reinforcement. This latter analysis accounts for the maintenance of unreinforced imitations, however, it does not clearily specify why Russian imitations improved in accuracy.

Since the procedures used in this experiment were not adequate to emperically differentiate between the possible explanations of the data presented here, a definitive explaination must await further developments in the areas of conditioned reinforcement and imitation.

FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.

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Table 1

Session by session summary of the Russian words presented to each subject

1. товарищ
2. карандаш
3. молоко
4. книга
5. словарь
6. девочка
7. мальчик
8. стена

Subject 1
Session No. and number of Russian words presented

1. none
2. (1, 2, 3)
3. (1, 2, 3)
4. (1, 2, 4, 5)
5. (1, 2, 3, 4, 5)
6. (1, 2, 3, 4, 5)
7. (1, 2, 3, 4, 5)
8. (1, 2, 3, 4, 5)
9. (1, 2, 5, 6, 7)
10. (1, 2, 5, 6, 7)
11. (1, 2, 5, 6, 7)
12. (1, 2, 4, 6, 7)
13. (1, 2, 4, 6, 7)

Subjects 2 and 3
Session No. and numbers the Russian words presented

1. none
2. (1, 2, 3, 7)
3. (1, 2, 3, 7)
4. (1, 2, 3, 5, 7)
5. (1, 2, 3, 5, 7)
6. (1, 2, 3, 5, 7)
7. (1, 2, 3, 5, 7)
8. (1, 2, 3, 7, 6)
9. (1, 2, 3, 5, 6)
10. (1, 3, 5, 6, 7)
11. (1, 2, 5, 6, 7)
12. (1, 2, 3, 5, 6)
13. (1, 2, 3, 5, 7)
14. (1, 2, 3, 4, 5)
15. (2, 3, 4, 5, 6, 8)
16. (2, 4, 5, 6, 7, 8)
17. (2, 4, 5, 6, 7, 8)
18. (1, 2, 3, 4, 7, 8)
19. (1, 2, 3, 4, 5, 6)
20. (1, 2, 3, 4, 5, 6, 8)

Table 2

1. товариш	tan var ish	12 345 67 plus 9	16 points
2. Карандаш	care an dash	123 45 678 plus 9	17 points
3. Малоко	mal a koy	123 4 567 plus 9	16 points
4. книга	kuh nee guh	12 34 56 plus 9	15 points
5. Словар	slo var	123 456 plus 6	12 points
6. Девочка	da borch ka	12 3456 78 plus 9	17 points
7. Малчик	mal chick	123 456 plus 6	12 points
8. стена	sten na	1234 56 plus 6	12 points

Russian spelling, approximate phonetic spelling and points for scoring

Table 3

RWA (Right - Wrong Agreement) is a measure of the percentage of agreement between the two analysts on whether the Russian pronunciation was totally correct or partially incorrect.

DCA (Degrees of Correctness Agreement) is a measure of the mean percentage of agreement between the two analysts for the degree of correctness measure.

Subject one

Sess.	RWA	DCA	Sess.	RWA	DCA	Sess.	RWA	DCA
2	1.00	.96	2	1.00	.96	2	.90	.95
4	.80	.87	3	1.00	.90	4	.90	.97
5	.90	.91	6	1.00	.92	6	.90	.97
8	1.00	.89	8	1.00	.90	9	1.00	.91
9	1.00	.91	9	.90	.84	10	.90	.84
12	.90	.87	11	.80	.94	12	.90	.96
13	1.00	.96	12	1.00	1.00	15	.92	.94
			13	1.00	1.00	16	.84	.90
			15	1.00	.94	18	.92	.98
			16	.84	.90	20	.86	.94
			18	1.00	1.00			
			19	.92	.98			
Total	6.60	6.37		11.46	11.28		9.04	9.36
Mean	.94	.91		.95	.94		.90	.936

Session by session scores for each Russian word

Subject 1														
Procedure		Reinforcement							DRO			Reinforcement		
Session No.		1	2	3	4	5	6	7	8	9	10	11	12	13
English words		.75	.80	1.00	1.80	1.00	1.00	1.00	.78	.50	.75	.80	.85	.88
	(1)		.63	.87	1.00	1.00	1.00	.72	1.00	.75		1.00	1.00	1.00
	(2)		.53	.76	.76	1.00	.88	.61	.76	.61		1.00	1.00	1.00
	(3)		1.00	1.00		1.00	1.00	.89						
	(4)				.88	1.00	1.00	1.00	.70		.73		1.00	1.00
	(5)				.65	.80	1.00	1.00	.85	.66	.63	1.00		
	(6)									.45	.50	.63	.57	.77
	(7)									.50	.50	.83	.50	1.00

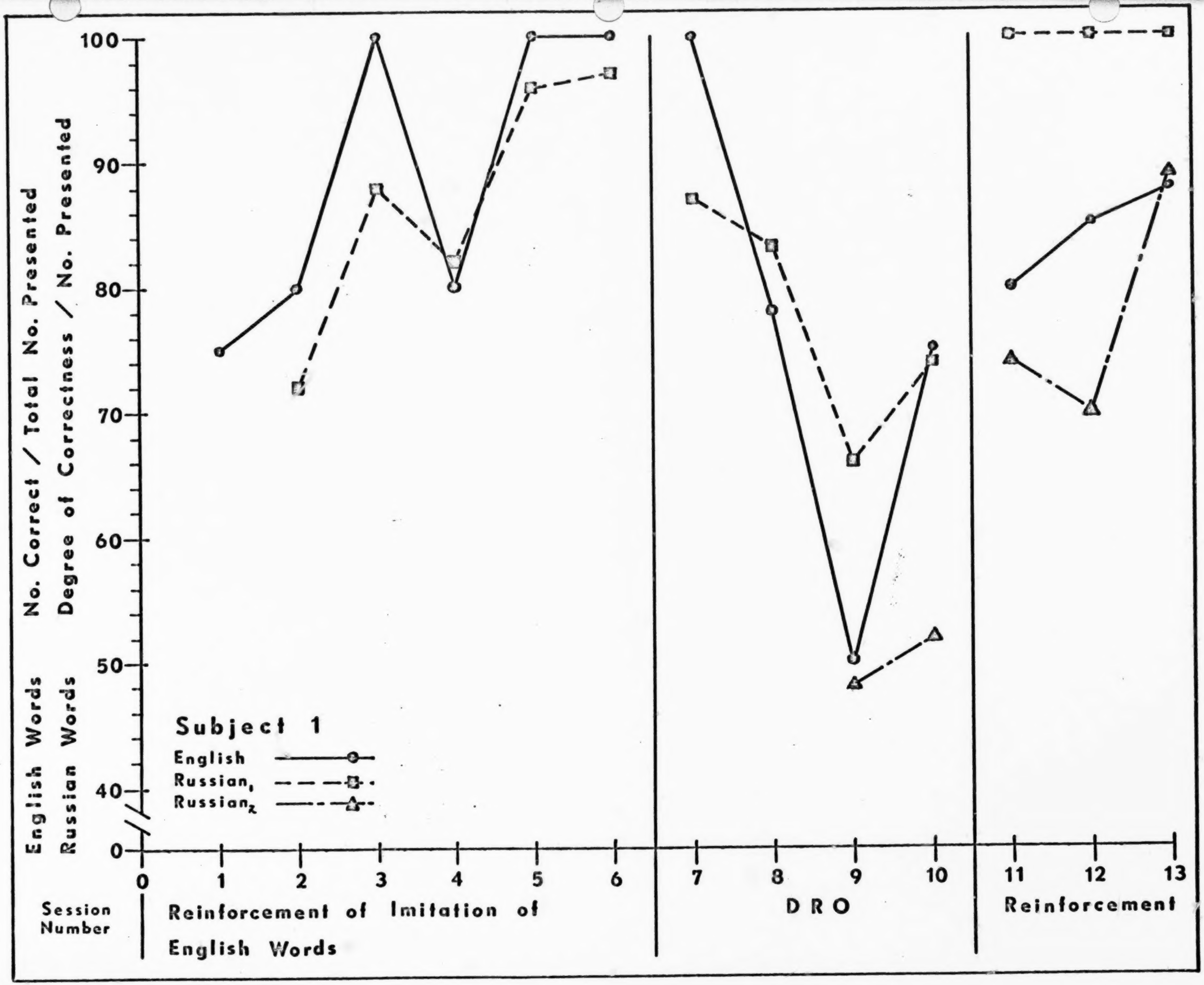
Subject 2

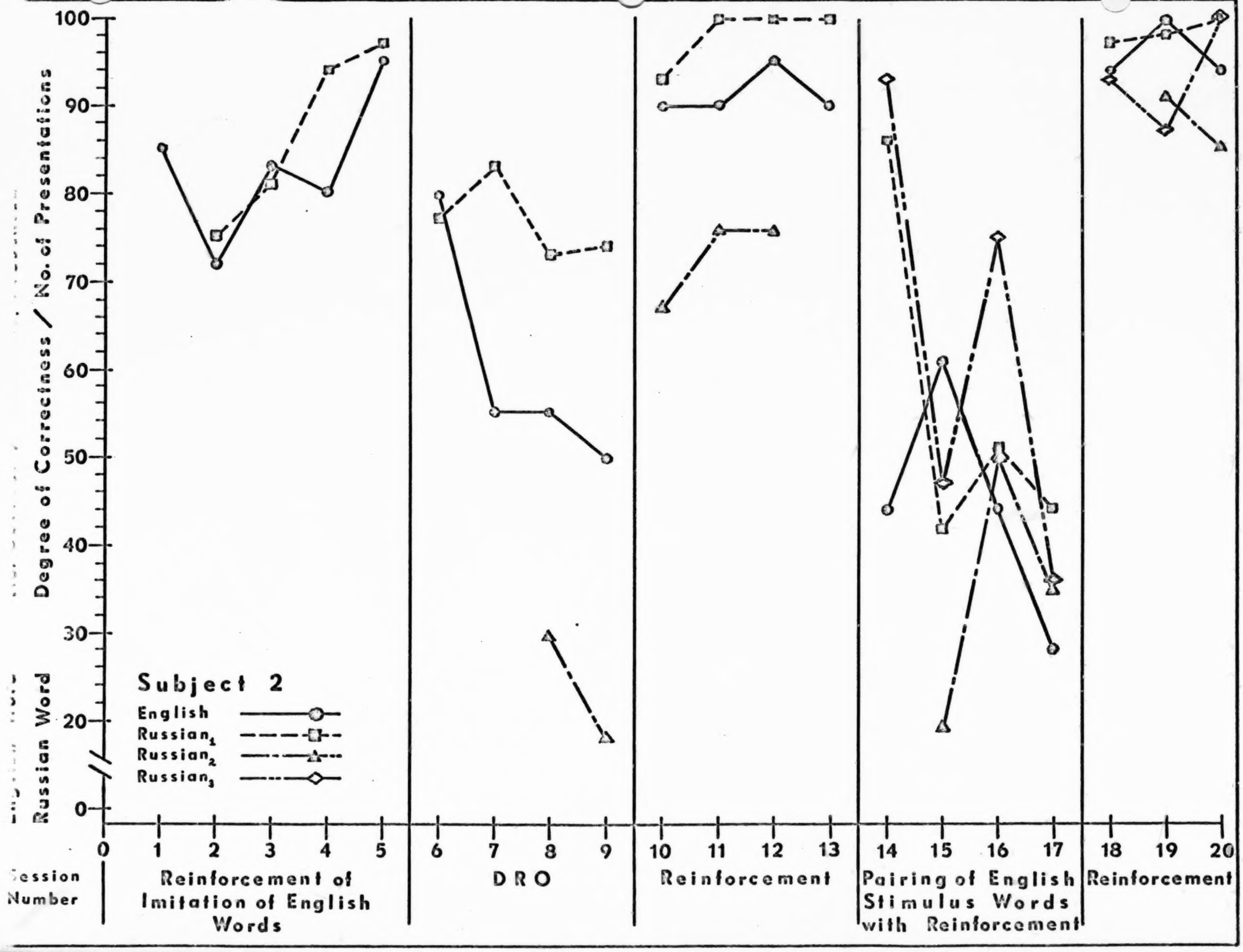
English words		.85	.90	.88	.80	.95	.80	.55	.55	.50	.90	.90	.95	.90
	(1)		.65	.75	1.00	1.00	.66	.88	.78	.63	1.00	1.00	1.00	1.00
	(2)		.76	.91	1.00	1.00	1.00	.88	.76	.71		1.00	1.00	1.00
	(3)		.83	1.00	1.00	.87	1.00	1.00	.72	.90	1.00		1.00	1.00
	(7)		.62	.66	1.00	1.00	.66	.66	.66		.71	1.00		1.00
	(5)				.72	1.00	.54	.71		.71	1.00	1.00	1.00	1.00
	(6)								.30	.18	.67	.76	.76	

Subject 3

English words		.95	1.00	.87	.90	.95	.85	.75	.75	.70	.95	1.00	1.00	1.00
	(1)		.75	1.00	1.00	1.00	.63	.72	.75	.75	1.00	1.00	1.00	1.00
	(2)		.76	.73	.76	.76	.53	.58	.50	.53		.76	.91	1.00
	(3)		.62	1.00	1.00	1.00	.50	.50	.92	.50	1.00		1.00	1.00
	(7)		.65	.85	1.00	1.00	.75	.79	.88		.88	.88		.88
	(5)				.83	1.00	.87	1.00		.75	1.00	1.00	1.00	1.00
	(6)								.62	.53	.70	.85	.62	

Subject 2															
Procedure		Pairing				Reinforcement			Pairing				Reinforcement		
Session No.		14	15	16	17	18	19	20	14	15	16	17	18	19	20
English words			.61	.44	.28	.94	1.00	.94	.77	.50	.60	.44	1.00	.94	.94
	(1)	.84	..			1.00	1.00	1.00	.75				1.00	1.00	1.00
	(2)	.87	.62	.68	.50	1.00	1.00	1.00	.88	1.00	.67	.76	1.00	1.00	1.00
	(3)	1.00	.50			1.00	1.90	1.00	.75	.75			1.00	1.00	1.00
	(7)		.76	.50	.50	.88				.71	.75	.75	.88		
	(5)	.83		.39	.33		1.00	1.00	1.00		1.00	.87		1.00	1.00
	(6)		.19	.50	.35		.91	.85		.63	.44	.53		.91	1.00
	(4)	.93	.77	.87	.47	.87	.87	1.00	1.00	.73	.60	.87	1.00	1.00	1.00
	(8)		.16	.62	.25	1.00		1.00		.62	.66	.70	1.00	1.00	1.00


English Words No. Correct / Total No. Presented
Russian Words Degree of Correctness / No. Presented
100
90
80
70
60
50
40
0
Session Number
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Reinforcement of Imitation of English Words
D R O
Reinforcement
Subject 1
English
Russian₁
Russian₂


Subject 2
English
Russian₁
Russian₂
Russian₃
Russian Word
Degree of Correctness / No. of Presentations
100
90
80
70
60
50
40
30
20
0
Session Number
0
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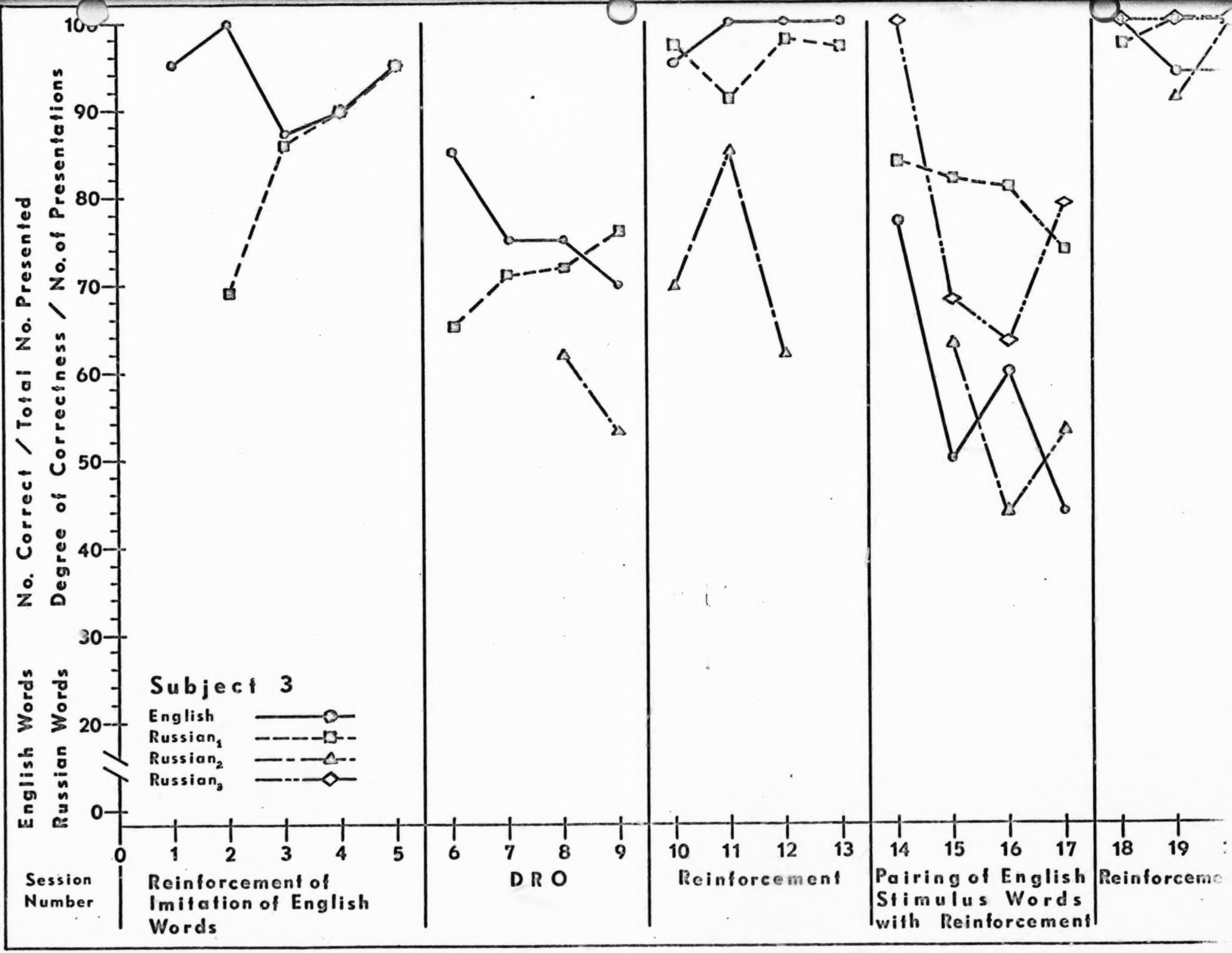
No. Correct / Total No. Presented
Degree of Correctness / No. of Presentations
English Words
Russian Words
100
90
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The University of Kansas Head Start Evaluation and Research Center

III.

"Effects of a Language Program on Children in a Head Start Nursery."

Margaret C. Byrne, Ph.D.

Department of Speech Pathology

The Effects of a Language Development Program on children in a Headstart Project

Under the supervision of
Margaret C. Byrne, Ph.D.

Speech Clinician and author
of project:
Betsy E. Ea[illegible]on, M.A.

University of Kansas

ABSTRACT

The purpose of this project was to test the effects of a compensatory language development program on a group of Headstart children. Such a program was administered to thirteen children enrolled in Headstart classes at Fairview Elementary in Olathe, Kansas, a small community neighboring Kansas City. For five months, daily sessions of approximately twenty minutes in length were held with small groups of three to five children. These children, plus a similar group who were not receiving the special language program, were tested prior to and following the program. Although few differences were shown between gains of the experimental and the control groups in total language age scores, significant differences were found on two subtests of the ITPA: the Vocal Encoding and the Auditory-Vocal Automatic. Only a small difference was shown between gains made by the two groups on the Peabody Picture Vocabulary Test. The children within the groups varied widely on all tests given, emphasizing the need for an even more individualized program than was administered during this project.

INTRODUCTION

It has become a well-known fact that the majority of children among the culturally disadvantaged show deficiencies in language development when compared with middle-class children. Tests of language and speech skills indicate that the language deficiencies cover the gamut of encoding and decoding possibilities. "Many disadvantaged children come close to the total lack of ability to use language as a device for acquiring and processing information." (Bereiter and Engelmann, 42). Because the ability to use language as a means of acquiring and processing information is vital to the ultimate well-being of the individual, particularly in shcool when the acquiring of information is concentrated, lack of this ability is of much concern to those attempting to find means of uplift for the lower socioeconomic levels of our society. It would seem that this ability to use language is vital to the success of the child in school and would thus be a basic factor in determining how long he remains in school.

Granting the need to compensate for restricted opportunities for language learning, the methods of successful compensation must be determined. Increased socialization, as is available in many nursery schools, does not seem adequate to this purpose (Eaton, 1967). One method of compensation which has been attempted is teaching certain language skills directly in language development sessions incorporated within preschool programs. This teaching is done by the regular preschool teacher or by a language specialist who works with small groups of hhildren at a time. One advantage of a language specialist would be that the children could be grouped according to their ability and be taught more according to individual needs. The purpose of this project was to test the effects of such a compensatory language development program on a group of Headstart youngsters.

PROCEDURES

Description of the Children

The children in the experimental group included seven girls and six boys, ranging in age from three years, three months to five years, ten months. The mean CA for this group was four years, four months at the beginning of the program, with a standard deviation of 8.6 months. Three of the boys and two of the girls were Negro; the rest were white. In the control group, there were seven girls and five boys, whose ages ranged from three years, seven months to five years, six months The mean age for this group was four years, seven months, with a standard deviation of 7.1 months. One of the girls and two of the boys in this group were Negro.

All the children attended either the morning or afternoon session of the Headstart program at Fairview Elementary School in Olathe, Kansas. Ninety per cent of these children had been labeled "culturally disadvantaged" according to the financial requirements set down by the Office of Economic Opportunity. Ten per cent of the total program consisted of children from the community who were not necessarily culturally disadvantaged but indicated they could benefit from the Headstart program. For example, three of the children have parents who are deaf. Exposure to a more normal speech environment seemed desirable for them.

Selection of the children for the experimental and the control groups was made from a list of names. Except for attention to equalizing the groups according to sex and race, selection was random. The children were drawn from four different classes: the experimental group from two different morning classes, and the control group from both morning and afternoon classes. It was thought that drawing the children from several classes would decrease the effects a specific classroom teacher might exert on a group of children and would thus tend to equalize the two groups.

The children were divided into three groups of four and five children each. The makeup of the groups was based on several factors: chronological age, ITPA Total Language Age, performance on the Vocal Encoding Subtest of the ITPA, and verbal expressive ability demonstrated on the recorded language samples taken at the beginning of the treatment period. Group I was made up of those children demonstrating least amount of skill with language. These tended to be the youngest children, although this was not completely true. Of the four children in this group, three were boys and one was a girl. Two of the boys were Negro. These children scored ITPA Total Language Ages at least one year, and generally more than one year, below what would be expected for their CA's. Their Vocal Encoding scores tended to be even more depressed in relation to their CA's. One boy is the child of deaf parents and has a brother and a sister, both deaf.

Group II consisted of two boys and two girls, who demonstrated a higher degree of verbal ability on the tests. All the children were older chronologically, and demonstrated language skills definitely more advanced, than those in Group I. However, on most of the tests they fell a few months to over a year below the norms for their ages. One girl originally in this group proved so upsetting to the rest by her behavior that she was removed from the group and was seen individually or with one other child for most of the remaining months. Occasionally, she was placed back in a group but never proved able to be placed in this situation consistently.

Group III was composed of five children who demonstrated the greatest amount of speech and language skill. These children proved to be, in general, the best behaved, the most attentive, and the most verbal. In contrast to those in the other groups, their test scores fell close to the norms for their ages and often rose above the norms.

Speech and Language Goals

Rather general goals were set up for this language program. These goals were established after the speech clinician had carefully examined the tests individually and had gained some experience working with the children. However, the general goals were based upon, not only the test scores of the children in this program, but on a wide variety of literature which attempts to discover the effects of cultural deprivation upon language and reports findings of attempts at remediation.

The general goals, on which the daily lessons were based, were the following:

1. Increased ability to sit and attend while a story is read or told to the children.

2. Ability to name members of categories, for example, animals, professions, colors, articles of clothing, and so forth.

3. Ability to make a first and second order statement (Bereiter and Englemann) about each category member, for example, "This is an animal. This animal is a horse. This horse is black."

4. Ability to follow logical sequence of events:

a. to solve picture problems by wording through evidence in the picture
b. to retell a familiar story in its proper sequence

5. Ability to use certain adjectives to describe objects, for example,

hard - soft	round - straight
rough - smooth	big - little
heavy - light	colors

Of course, the ability of the individual children determined to a large extent what benefits they were able to receive from the language program. The wide range of language abilities among the children in the experimental group necessitated formulation of individual goals for each child. It was hoped that grouping on the basis of ability could help meet each child's individual needs. Some children who demonstrated needs which could not be adequately met in a group were worked with individually as often as time permitted.

Testing Procedures

Test Administration

Tests were administered prior to and following completion of the language development program. Testing was done by four research assistants trained in administering the tests. All were employees of the Headstart Research and Evaluation Center at the University of Kansas and all had had a good deal of experience testing this type of child.

The various tests were administered to the children individually in small rooms within the school building. Testing of each child was done in three separate periods during the pretesting and in two periods during the post-testing. The same tester administered the same tests to each child during the pre- and post-test periods, to eliminate any tester bias which might occur. The children were told they were to "play a game" with the examiner and most were willing to do so.

Testing Materials Used

Three tests were administered at the beginning of the language program and two tests were given six months later at the completion. The third test was not administered during the post-testing because of the loss of the research assistant qualified to record the responses.

As a measure of over-all language ability, the Illinois Test of Psycholinguistic Abilities was chosen. This test consists of nine subtests, each measuring a different aspect of language adeptness. The ITPA tests skills in not only the auditory and vocal modalities but the visual and motor areas, too. Language age and standard score norms are available for each subtest as well as for the test as a whole.

To test the receptive vocabularies of the children (those words a child understands when he hears them), the Peabody Picture Vocabulary Test was used. The child was required to point to a picture out of a choice of four as the examiner said, "Show me_______".

A third test, given only at the beginning of the program, was the Irwin Articulation Test. This test, in a stage of development, tested the child's ability to produce the sounds of the English language. The words used to elicit each sound were presented through four means: black and white drawings, colored slides, colored drawings and three dimensional objects. The child's ability to correctly label the object was measured as well as his articulation skill.

Observation of the Children

For six weeks the language development sessions were observed three days a week by a research assistant from the Headstart Research and Evaluation Center at the University of Kansas. Various aspects of each child's listening or speaking behavior were recorded. From these recordings it was possible to make graphs charting any behavior change indicating possible trends. Also, a record of language used during the sessions by certain children was kept and this language was later broken down using as a model, Laura L. Lee's Developmental Sentence Types.

RESULTS

ITPA

Pretest

On this test, the experimental group scored a mean total raw score of 68.3, with a standard deviation of 29.4, and a total range of 95 points. In the control group, the mean total raw score was 75.4, with a standard deviation of 22.8 and a range of 91 points. The mean total scores convert to language ages of 3-8 for the experimental group and 3-10 for the controls. These ages are eight and nine months below their mean CA's when pretesting was done.

Post-test

Following completion of the language program, the experimental group scored a mean total raw score of 89.2, which is 20.9 points above the pretest score. The standard deviation was 30.8 and the range was 105 points. The control group scored a mean total of 89.2, the same as the experimental group but only 13.8 points above the control group's pretest mean. The standard deviation for this group was 23.7 with a range of 79 points.

Both groups' mean total raw scores convert to language ages of 4-3. This constitutes a five-month gain for the experimental group and a three-month gain for the controls. While the experimental group was one nomth closer to a language age coinciding with its mean chronological age, the controls were even more behind (ten months) than they were at the pretesting.

t tests were run to determine any statistically significant differences between the following means:

Pre- and post- test of the experimental group
Pre- and post- tests of the control group
Experimental pretest vs. post-test mean and the control pretest vs. post-test means.

None of these t tests showed a significant difference between means at the .05 level.

The individual means of the subtests were also compared. For each of the nine subtests, the pretest for the experimental group was subtracted from the post-test for that group to determine the amount of gain made between pre- and post- tests. The same procedure was followed for the control group. The mean difference of the experimental group was then compared to that of the control group on each subtest. On two subtests, the mean differences between groups were statistically significant at the .05 level. These subtests were Auditory-Vocal Automatic and Vocal Encoding, on which the amount of gain was 1 year, 1 month and 11 months more, respectively, in the experimental group than in the control group. The t for difference between groups on the Auditory-Vocal Automatic subtest was 2.16, with 2.07

needed for significance. The *t* for the Vocal Encoding difference between groups was 2.44, with 2.07 needed for significance.

On all other subtests except Visual Motor Sequencing and Visual Motor Association, the difference in gain between the experimental group and the control group favors the experimental group but fails to reach statistical significance.

PPVT

Pretest

The experimental group scored a raw score mean of 35.8, with 13.9 standard deviation and a 42-point range. This raw score converts (Table 2, Expanded Manual) to a receptive vocabulary age of 3-6, ten months below the mean CA of this group. The control group scored a raw score mean of 31.5, which converts to a vocabulary age of 3-3, one year, four months below their mean CA. This group was more homogeneous, with a standard deviation of 10.2 and a range of 27.

Post-test

Both groups scored 4.8 points above the pretest mean scores. In converting these scores to receptive vocabulary ages, however, the experimental group again increased five months (3-11 vocabulary age) while the control group gained only three months (3-6 vocabulary age).

No *t* test was considered necessary for this test because the difference between pre- and post-test means were identical for both groups.

Irwin test

Because no post-testing could be done with this test and no normative data is available for comparative purposes, only the results of the pretesting may be reported. Little interpretation of these results is possible.

The Irwin test consists of 112 items. Out of these, the experimental group had a mean score of 33.3 articulation errors and 33.0 word recognition errors. The control group had a mean of 24.3 articulation errors and 28.3 word recognition errors.

As explanation when comparing the two groups, particularly with regard to articulation errors, the difference in mean CA's of the two groups and the wider CA range in the experimental than the control group could be influential factors. The youngest child in the experimental group was only 3 years, 3 months while the youngest in the control group was 3 years, 7 months. At an age when articulation is maturing very rapidly in most children, a difference of four months can mean a substantial increase in articulatory skill.

The word recognition scores followed the same trend as the articulation scores, with the older, control group making fewer errors than the younger, experimental group. These scores are somewhat surprising, however, when one compares them to those on the PPVT, on which the experimentals did better on both the pre- and post-testing.

Discussion of the Test Results

In interpretin[illegible]e results of the ITPA and the PPVT, one must keep several facts in mind concerning the children.

1) The control group was slightly older than the experimental group.
2) The ranges and standard deviations on all the tests were extremely

high. This indicates a great deal of variability among the children before the program began and this variability continued throughout.

3) The difference in the N's is due to the children's irregularity of attendance. Although both groups started with fourteen children each and contained equal numbers of boys and girls, children either moved away or were absent from school so long post-testing became impossible.
4) This poor attendance which affected the testing was prevalent throughout the period of the langrage program. During a period of twenty-two days near the beginning of the program, four children were absent nine or more days, or over 40% of the time. Five more were absent three or more days, or almost 14% of the time. Poor attendance is due to a number of causes and can, of course, be expected to occur more in dealing with young children. Nevertheless, when attendance is irregular, the amount of learning possible by a child is lessened drastically. Not only is the child exposed to fewer learning experiences, but he must continually be re-adjusting to the social situation. It seems probable that the learning experiences he is exposed to would not be greatly effective while the social adjustment is incomplete.

In comparing each group's performance on the ITPA prior to and following the language program, the experimental group showed gains on all the subtests except the Visual-Motor Association test, on which the means were the same. This is not true for the control group, however, which showed losses on two subtests and remained the same on two others. The biggest gains made by the experimental group were on the Auditory-Vocal Automatic test, the Vocal Encoding test, and the Auditory-Vocal Association test. The skills required on these subtests are used directly when employing a verbal language. They include the grammar, the descriptive vocabulary and word association which enables the speaker to accurately communicate his thoughts and the listener to accurately interpret what he hears, as well as gain some indication of the home environment and socio-ecomonic-status of the speaker.

It is not surprising that the greatest gains in the experimental group were made on these three subtests considering the nature of the language development program. Each child was challenged again and again to describe objects, pictures, people and actions. Each child heard good sentence structure and correct grammar from the teacher, was asked to listen for several fine points of grammar and was required to imitate many of the teacher's language models. All activities offered a wealth of vocabulary. It is interesting that on these three subtests and on most of the others, the post-test scores came much closer to what might be expected from culturally-advantaged youngsters of the same age than do the pretest scores. This seems to indicate that the language deficit is beginning to be overcome. Because the abount of gain on the same three subtests mentioned bbove was not nearly as great in the control group, it would be fairly safe to say the gains in the experimental group were largely due to the compensatory language program.

Behavior Characteristics of the Children

Not only was the range in chronological ages wide but so was the range in maturity of the children. At the beginning of the program some of the younger children had not yet learned to do various self-helps, such as putting on or zipping their coats or blowing their own noses. Some were initially quite hesitant about leaving the rest of the children to go with the speech clinician. With some, fear of the strange situation seemed to be the problem. With others, unwillingness to leave the activity in which they were presently engaged posed the difficulty. This problem might not have occurred if the facilities for the testing and teaching had been different. As it was, in the first month lack of a private area made it necessary to use a small room in a building separate from the Headstart classes. In the cold weather the children had to put on their coats to walk between buildings. For some this was welcomed; for others, however, it only emphasized the fact they were being drawn away from the rest of the group. One child was particularly reluctant most of the time. Instead of forcing her to go or even asking her day after day and letting her refuse, time was spent with her alone for a few minutes each morning, letting her see that what was done could be desirable and fun, and yet preventing her from completely controlling the situation.

The children's behavior posed difficulties for several weeks. They became easily distracted from the lesson and would move from their seats, fight among each other or run to investigate drawers or other interesting parts of the room. For the first several weeks they would seldom attend to a lesson for more than ten minutes at a time. One of the boys in the experimental group was of age to be attending kindergarten but had been kept out because of his uncontrolled behavior. The teacher's admonishments had little effect on disruptive behavior, which was usually begun by one child and then spread throughout the group. Various rewards and punishments were tried. During certain activities plastic colored chips were given for correct responses. The chips, which could be chained together, were rewarding to most of the children if used infrequently, but lost appeal if used every day. The children enjoyed holding the cards used in the activities but would often fight over them and some were simply disinterested in holding them at all. The only punishment found effective was taking them to talk with the principal, who was a man. However, as a method to control behavior the punishment was too far removed from the behavior punished and proved unsatisfactory.

Finally, a reward system was devised which did prove effective. The children were told that for each day they sat in their seats for the entire period of the language session and paid attention to the teacher, they would get a "happy face" drawn on a chart after their names. After accumulating a certain number of these happy faces, they would receive a "prize" (a dime-store toy) which would be theirs to take home and keep. The children responded immediately. Some of the more immature had difficulty understanding that they would not receive a prize each time they earned a happy face and the teacher had to continually re-explain the system. Probably a more immediate reward would have been better with these young children.

By the end of the program, the children's behavior had changed considerably. Average length of the sessions was twenty minutes and some sessions could have easily run longer. The children remained in their seats for the most part and attended well to the activities. The one child who was seen individually was never successfully integrated into a group although she did work well with one other child, usually. Charts of certain children's listening attention span are included at the end of this section. This behavior was recorded during the last month of the program by an observer who observed each child for an average of six minutes per session and recorded whether he was attending or not each five seconds of that period. The percentage of time the child attended during that period was then computed. Although this percentage varied considerably for every child, it tended to hover around 85%, and varied from 35% to 100%.

The children in the experimental group who seemed to benefit most by the language program were those who scored fairly high on the pretests. One child gained one year, five months on the ITPA, going from an LA of 3-7 to 5-0 in a five month period. Another gained two years, one month, going from an LA of 3-7 to 5-8. It is logical, of course, that children who have achieved the most will continue doing so, being able to grasp concepts quicker and retain information longer than other children. Also, having a firmer basis to build on, these children naturally derive more from what is presented them.. The varience in gains made in the program must be taken as evidence that, in order to reach all the children, and particularly those who most desperately need help catching up, more individualized approaches must be utilized in the classroom. The effort needed to teach some in the Headstart classroom a series of verbs, for instance, must be doubled or tripled for other children who need a great deal more repetition to learn a lesson. The need to break down the class into homogeneous groups in presenting a language program would, of course, require a great deal of the teacher's time if a special language teacher was not available. The aides could be of enormous assistance in implementing a program of this kind, carrying on activities within the classroom while a certain small group was taken by the teacher for more specialized instruction. It seems vital that this type of teaching be done in the Headstart classroom, if the classes are to remain as hetergeneous as they normally have been.

SUMMARY AND CONCLUSIONS

A language development program was given to thirteen youngsters enrolled in Headstart classrooms at Fairview Elementary in Olathe, Kansas. For five months, daily sessions of approximately twenty minutes in length were held with small groups of three to five children. These children, plus a similar group who were not receiving the special language program were tested prior to and following the program. These scores were analyzed to determine whether the children valued from the language program and if so, in what special areas were particular gains made.

Very little difference was shown between the gains of the experimental and the control groups in total language age scores. Significant differences were found, however, on two subtests of the ITPA: the Vocal Encoding and the Auditory-Vocal Automatic. These subtests, which test grammar skills as well as ability to use adjectives in describing objects, show skills obviously gained in the language program.

Only a small difference was shown between gains made by the two groups on the Peabody Picture Vocabulary Test. This is surprising considering a great deal of emphasis was given to vocabulary in the program.

Because the Irwin Articulation Test was given only once, at the beginning, no comparisons may be made as to speech skills acquired during the program.

The children showed wide varience on all the tests given. This indicates the need for an even more individualized program than was administered, to reach the slowest learners as well as those who learn rather quickly. One program administered to a group this varied could not possibly benefit more than a fraction of the group.

Materials Used in the Lessons

Peabody Language Development Kit. Level #1. Published by American Guidance Service, 720 Washington Ave. S.E., Minneapolis, Minn. 55414. About $50.

Toys used:
- Miniature farm animals
- Balls of various colors and shapes
- A felt board on a metal stand
- Glass marbles
- Old Maid cards

Books

Bond, Gladys B. The Magic Friend-Maker, Racine, Wis.: Whitman Publishing Co., 1966. $.69.

__________ Patrick will Grow, Racine, Wis.: Whitman Publishing Co., 1966. $.69.

Bradfield, Joan and Roger. Who are You?, Racine, Wis.: Whitman Publishing Co., 1966. $.69.

Brightman, Homer. Mary Poppins, Racine: Whitman Publ. Co., 1964. $.19.

Crawford, Mel. The Turtle Book, New York: Golden Press, 1965. $.29.

Davis, Daphne. The Baby Animal Book, N.Y.: Golden Press, 1964. $.29.

Dugan, William. The Truck and Bus Book, N.Y.: Golden Press, 1966. $.29.

Funk, Melissa D. Pals, Racine: Whitman Publ. Co., 1966.

Grant, Cambell. Cinderella, N.Y.: Golden Press, 1950. $.29.

Hogstrom, Daphne. Little Boy Blue, Racine: Whitman Publ. Co., 1966

Kaufman, Joe. The Toy Book, N.Y.: Golden Press, 1965.

Keats, Ezra Jack. The Snowy Day, N.Y.: The Viking Press, 1964.

Knoche, Norma R. and Jones, Mary V. What Do Mothers Do?, Racine: Whitman Publ. Co., 1966. $.69.

Lewis, Shari and Reinach, Jacquelyn. The Headstart Book of -
Knowing and Naming
Looking and Listening
Thinking and Imagining
N.Y.: McGraw-Hill Book Co., 1966. $1.95 each.

Milne, A.A. Winnie-the-Pooh, N.Y.: Golden Press, 1965. $.29.

Nathan, Stella W. Chicken Little, Racine: Whitman Publ. Co., 1966. $.69.

Nicholas, Charles. The Elephant Book, N.Y.: Golden Press, 1965. $.29.

Peter Rabbit, Racine, Wis.: Whitman Publishing Co., 1963. $1.00.

Pfloog, Jan. The Tiger Book, N.Y.: Golden Press, 1965. $.29.

Pfloog, Jan. *The Bear Book*, N.Y.: Golden Press, 1965. $.29.

Schwalje, Marjory. *A Pet at the Zoo*, Racine: Whitman Publ. Co., 1965. $.29.

The Three Bears, Racine: Whitman Publ. Co., 1952. $.19.

Walt Disney Productions. *Bambi*, Racine: Whitman Publishing Co., 1966. $.29.

Watts, Mabel. *Where is the Keeper*? Racine: Whitman Publ. Co., 1961. $.59.

Wegner, Helmuth G. *Snow White and the Seven Dwarfs*, 1962. $.19.

Williams, Ben. *The Three Little Pigs*, Racine: Whitman Publ. Co., 1959. $.19.

Wright, Betty. *Good Morning, Farm*, Racine: Whitman Publ. Co., 1964. $1.00.

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Dunn, Lloyd M. Expanded Manual: Peabody Picture Vocabulary Test. Minneapolis, Minn.: American Guidance Service, Inc., 1965.

Eaton, Betsy. "The Effects of a Preschool Program on the Speech and Language of Some Culturally Disadvantaged Children." Unpublished Master's Thesis: University of Kansas, 1967.

Lee, Laura L. "Developmental Sentence Types: A Method for comparing Normal and Deviant Syntactic Development." Journal of Speech and Hearing Disorders, 4, 31, 1966, p. 311.

McCarthy, James J. and Kirk, Samuel A. Examiners Manual: Illinois Test of Psycholinguistic Abilities, Institute for Research on Exceptional Children, University of Illinois, Urbana, Illinois, 1961.

	Chronological Age			
	Pre-Mean	Post-Mean	Standard Deviation	Range
Experimental	4yrs. 4mo.	4yrs. 10mo.	8.9 mo.	2yrs. 7mo.
Control	4yrs. 7mo.	5yrs. 1mo.	7.1 mo.	1yr. 11mo.

Test	Raw Score Mean		Standard Deviation		Range		Language age Converted	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
ITPA Total								
Experimental	68.3	89.2	29.4	30.8	95	105	3-8	4-3
Control	75.4	89.2	22.8	23.7	91	79	3-10	4-3
PPVT								
Experimental	35.8	40.6	13.9	11.2	42	39	3-6	3-11
Control	31.5	36.3	10.2	13.7	27	22	3-3	3-6

Irwin	Artic. Errors			Word Rec. Errors		
	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range
Experimental	33.3	18.8	57	33.0	31.3	71
Control	24.3	18.0	60	28.3	11.3	48

Table 1. -- Means, Standard deviations and ranges for comparison of the experimental group's and the control group's pre- and post-test scores.

	Experimental			Control		
	Pre L.A.	Post L.A.	Gains L.A.	Pre L.A.	Post L.A.	Gains L.A.
Auditory-Vocal Automatic*	3-6	4-7	1-1	4-3	4-3	0
Visual Decoding	3-8	4-5	0-9	4-1	4-9	0-8
Motor Encoding	3-6	3-10	0-4	3-6	3-2	0-4
Auditory-Vocal Association	3-6	4-5	0-11	3-8	4-5	0-9
Visual-Motor Sequencing	4-2	4-4	0-2	4-7	4-4	0-3
Vocal Encoding*	3-2	4-5	1-3	3-2	3-6	0-4
Auditory-Vocal Sequencing	4-2	4-7	0-5	4-2	4-2	0
Visual-Motor Association	4-0	4-0	0	3-8	5-1	1-5
Auditory Decoding	3-6	4-1	0-7	3-10	4-3	0-5

*Difference between gains of the experimental and the control group is significant at the .05 level.

Table 2. -- Pretest and post-test language age scores and the gains made by each group on each of the subtests of the ITPA.

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KEUFFEL & ESSER CO.

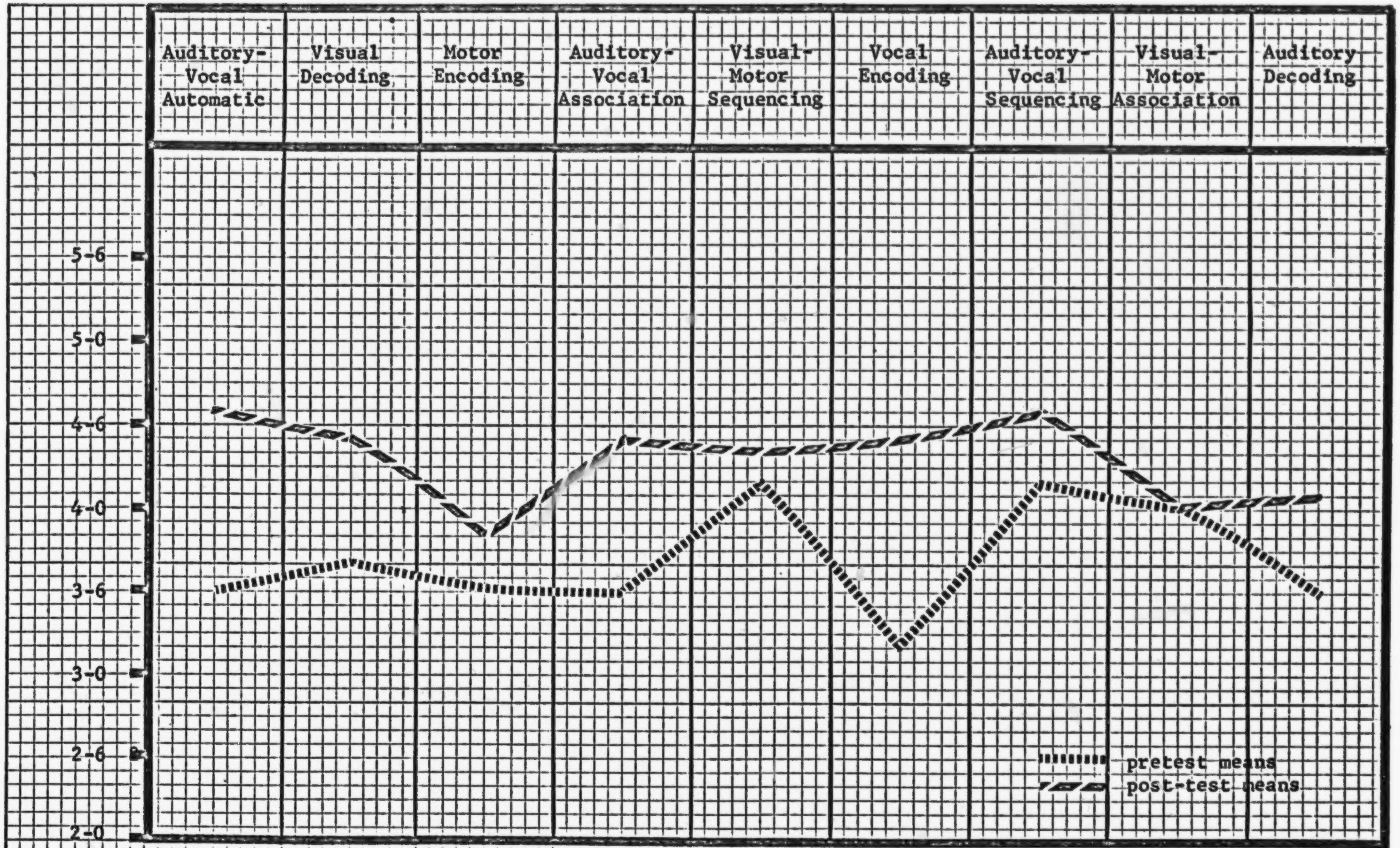

Figure 1. -- Comparison of the pre- and post- language age mean scores of the experimental group.

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7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

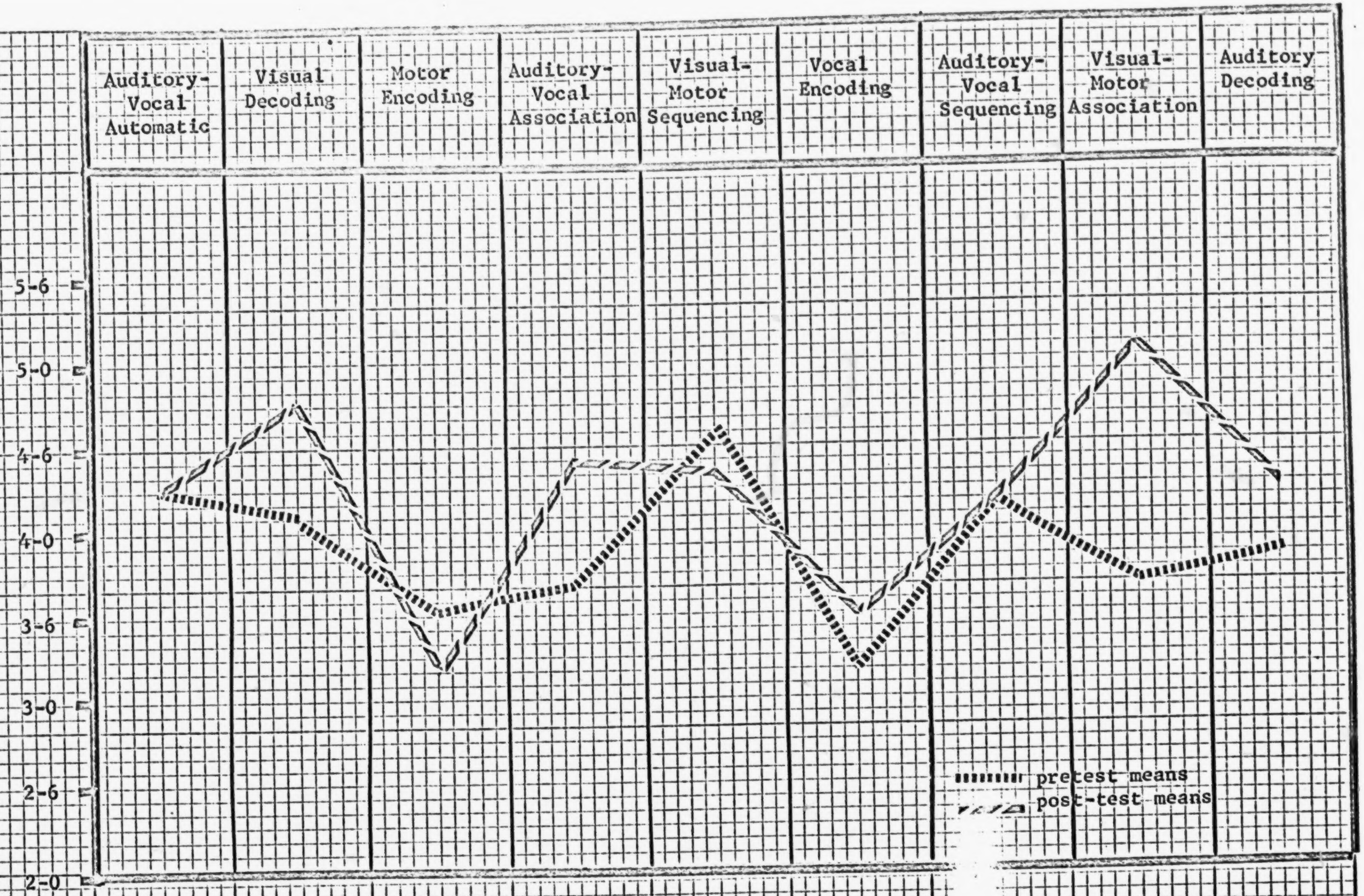


Figure 2. -- Comparison of the pre- and post- language age mean scores of t control group.

K+E 10 X 10 TO THE INCH 46 0700
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

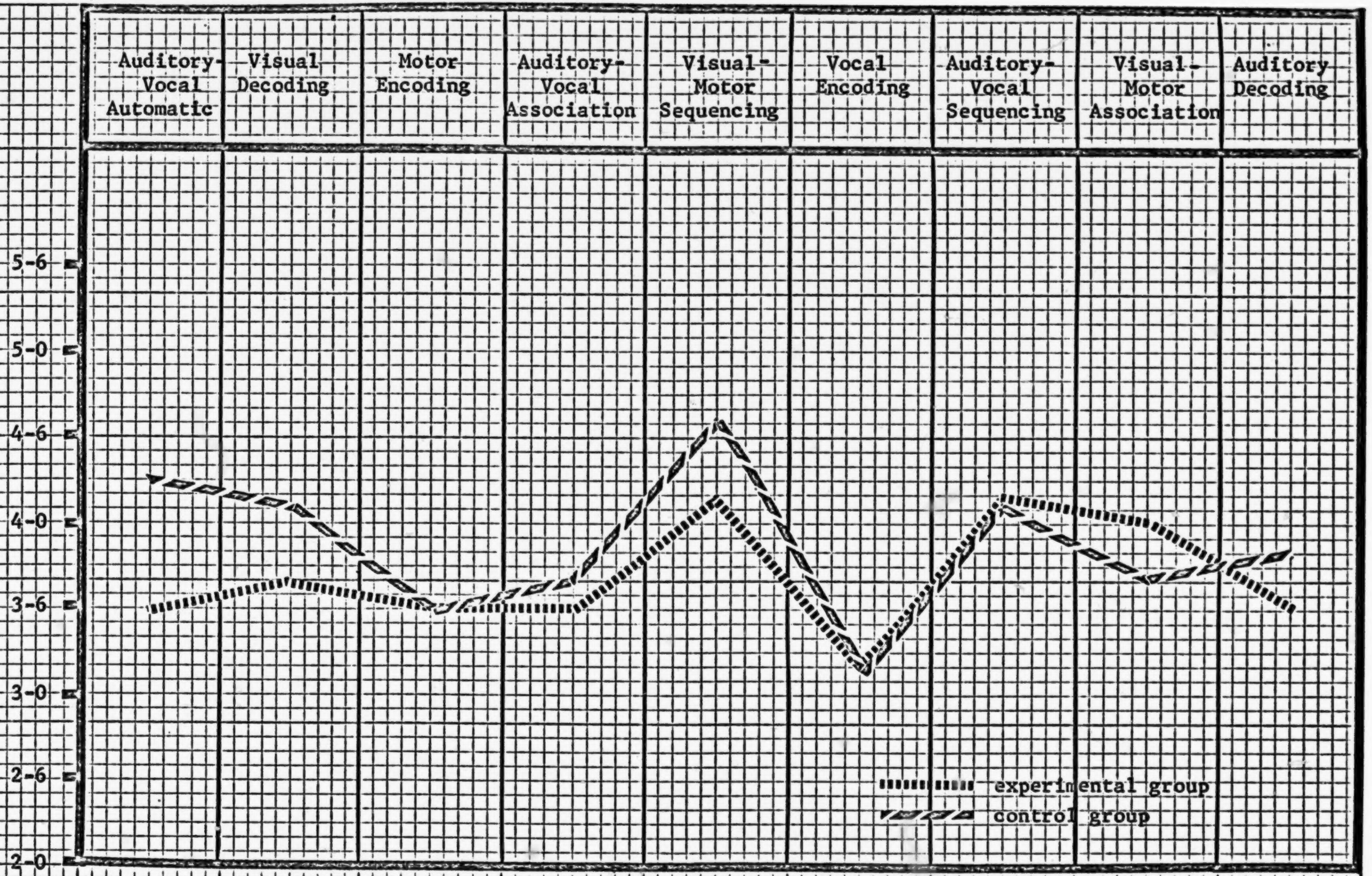


Figure 3. -- Comparison of pretest language age means of the experimental and the control groups.

K+E 10 X 10 TO THE INCH 46 0700
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

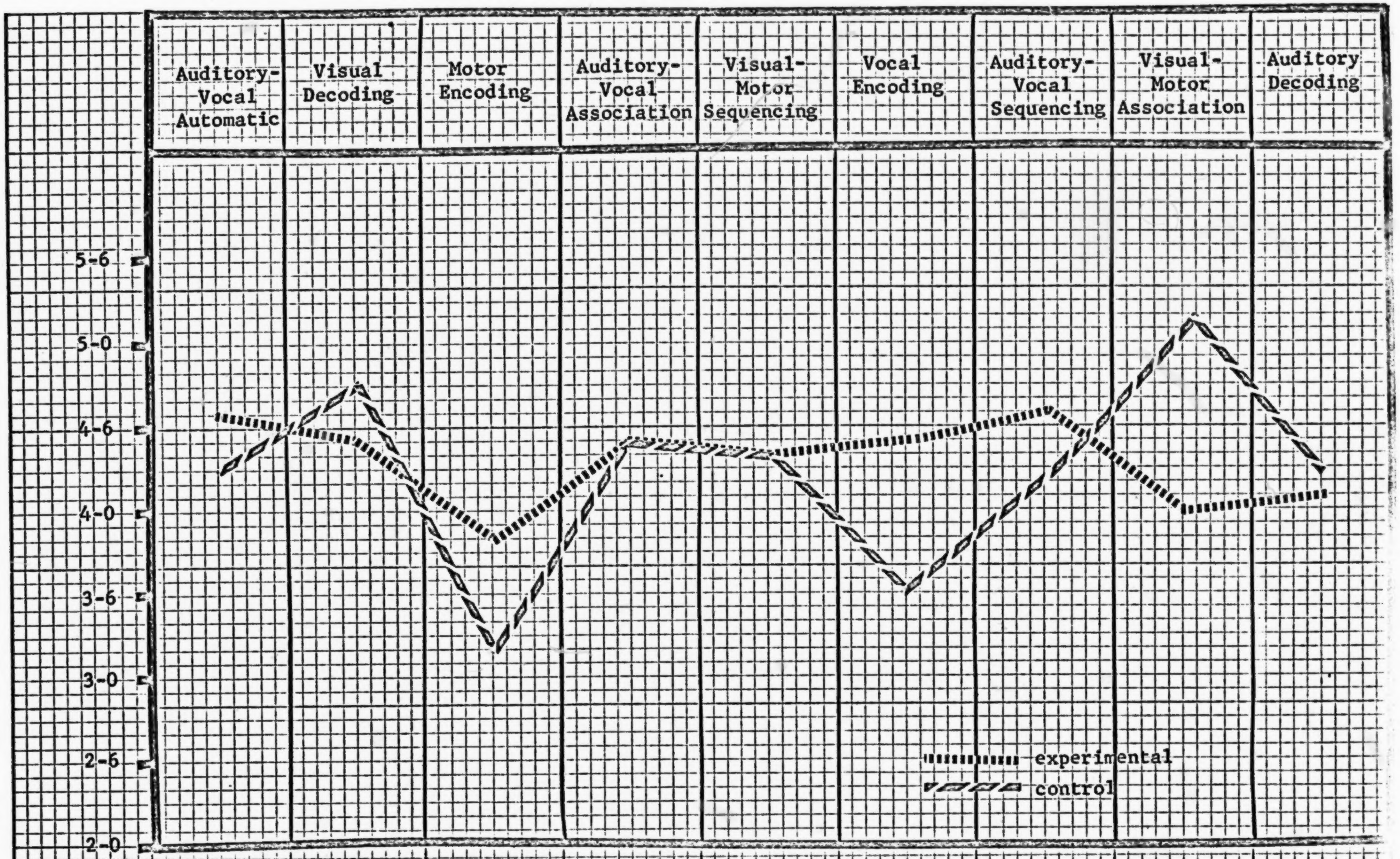


Figure 4. --Comparison of post-test language age means of the experimental and the control groups.

K+E 10 X 10 TO THE INCH 46 0700
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

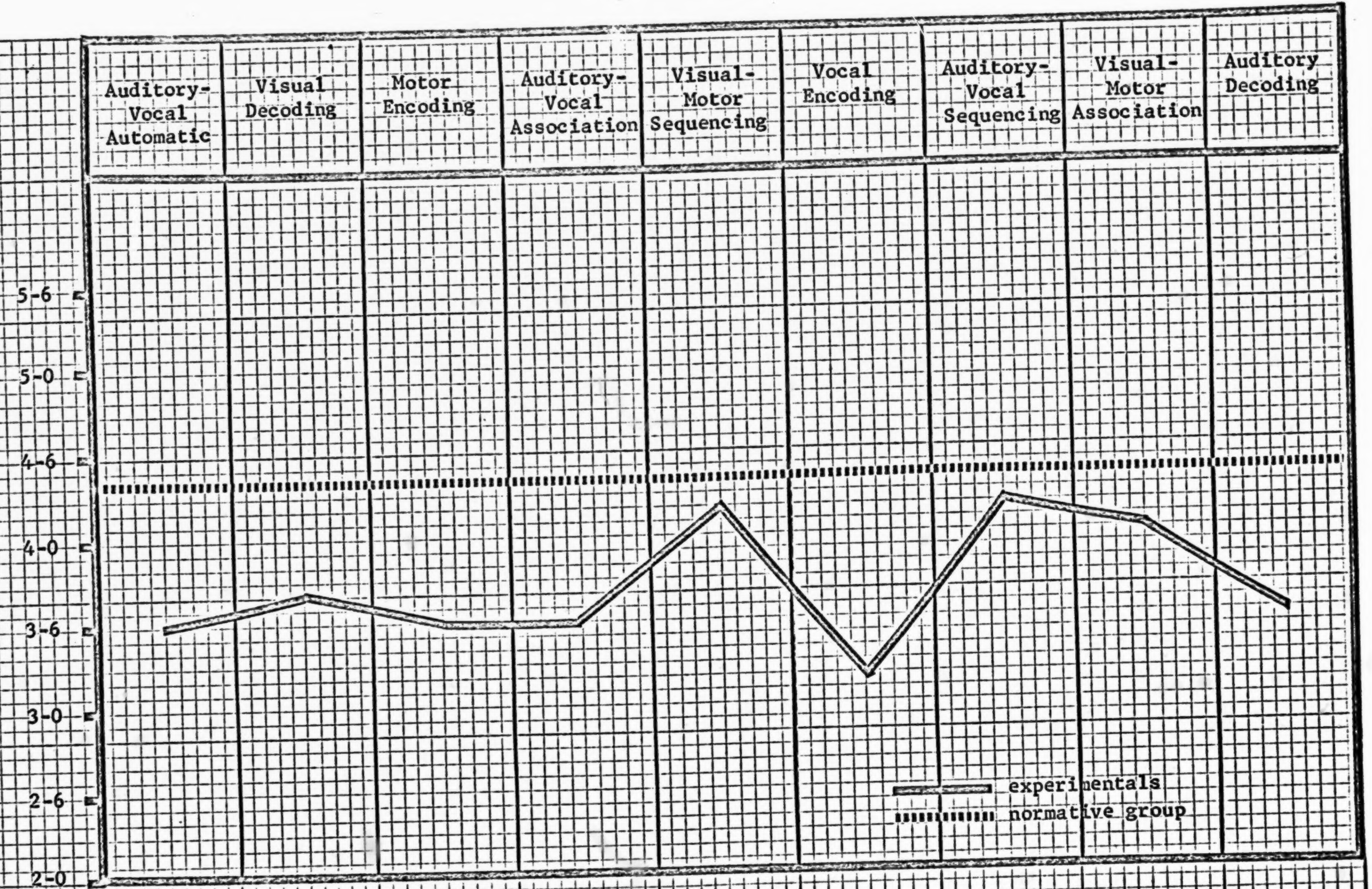


Figure 5. -- Comparison of the experimental group's pretest L.A. means with the normative group at the mean CA of the experimental group.

K&E 10 X 10 TO THE INCH 46 0700
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

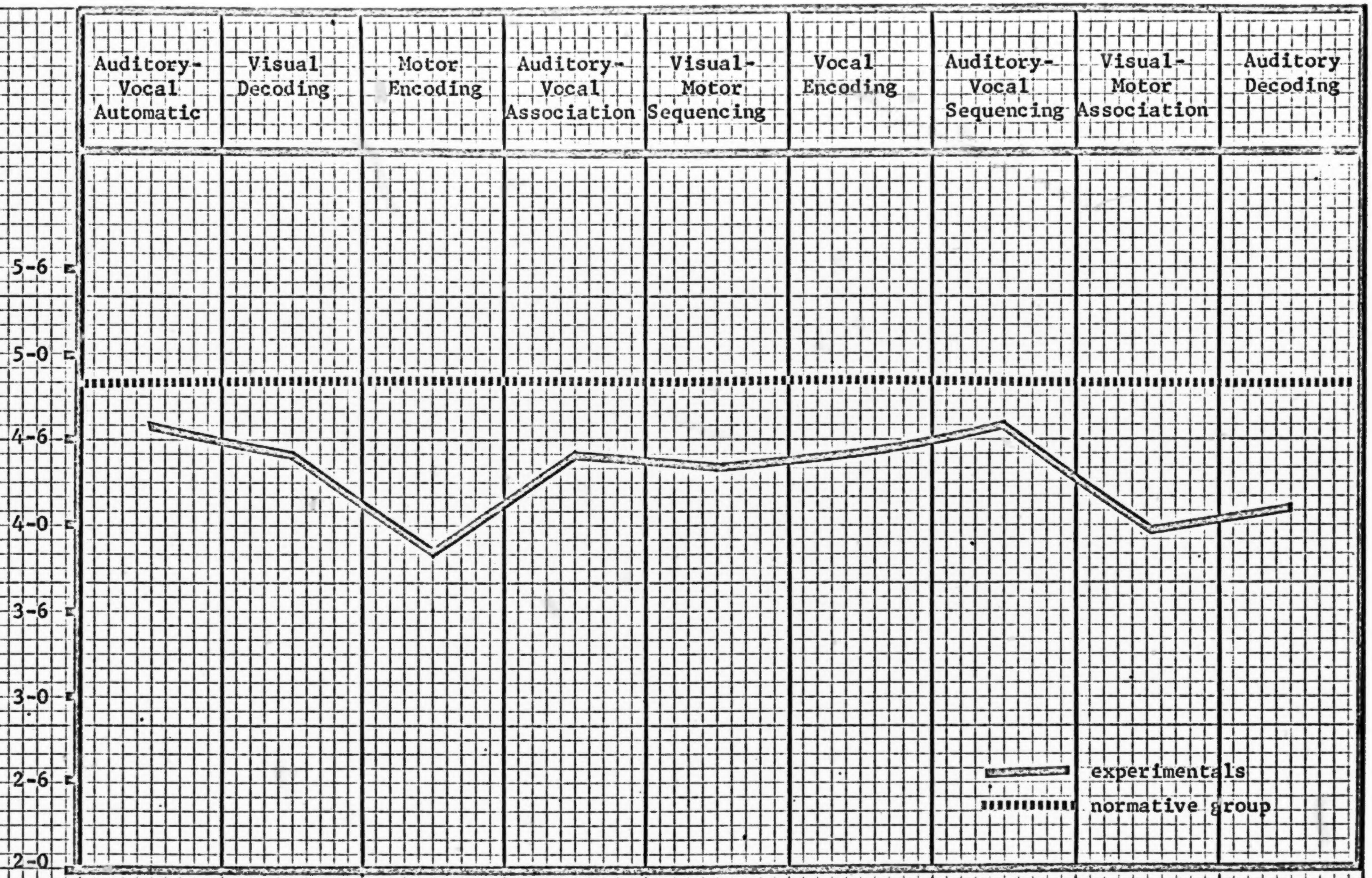


Figure 6. -- Comparison of the experimental group's post-test L.A. means with the normative group at the mean CA of the experimental group.

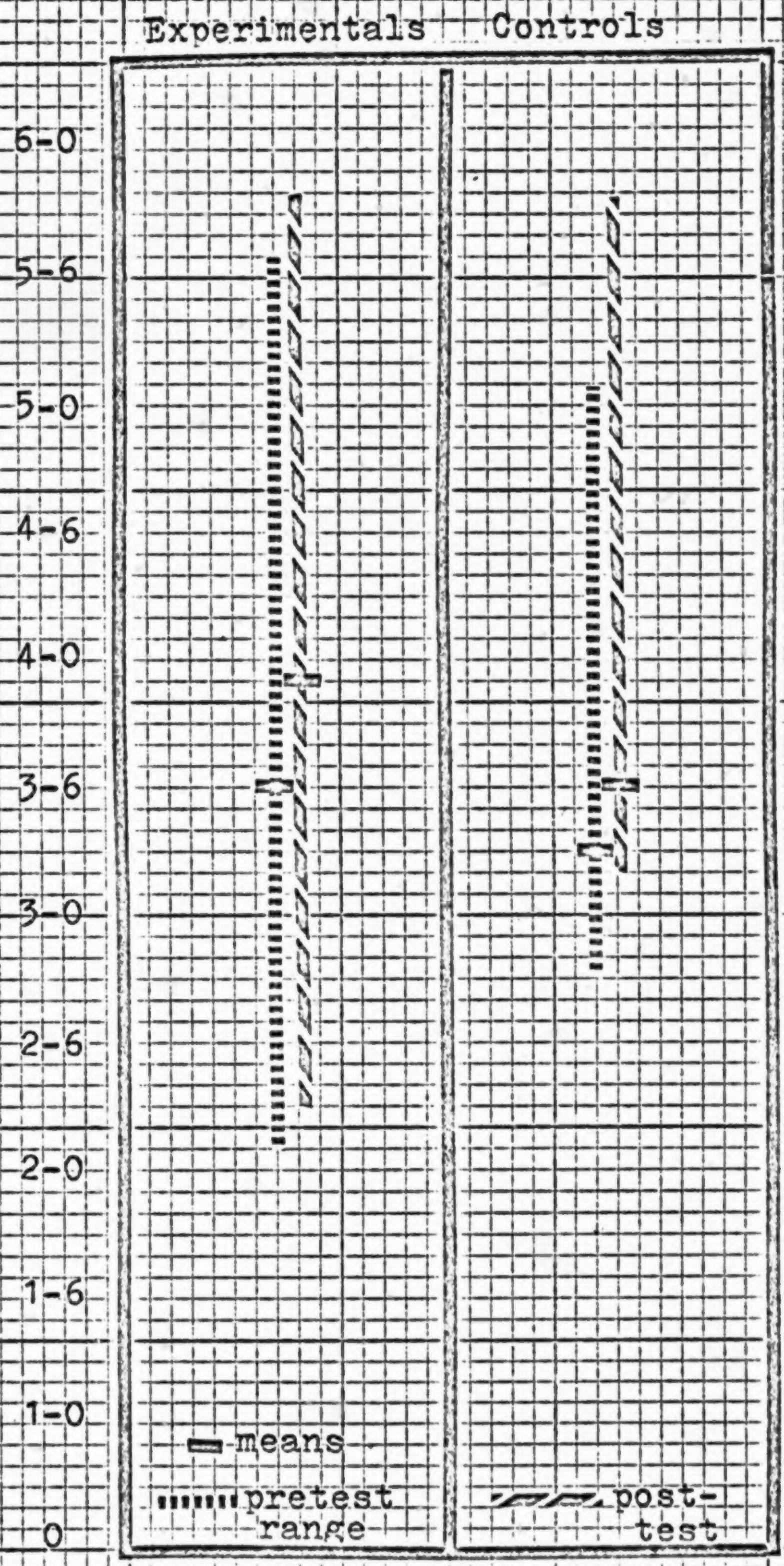
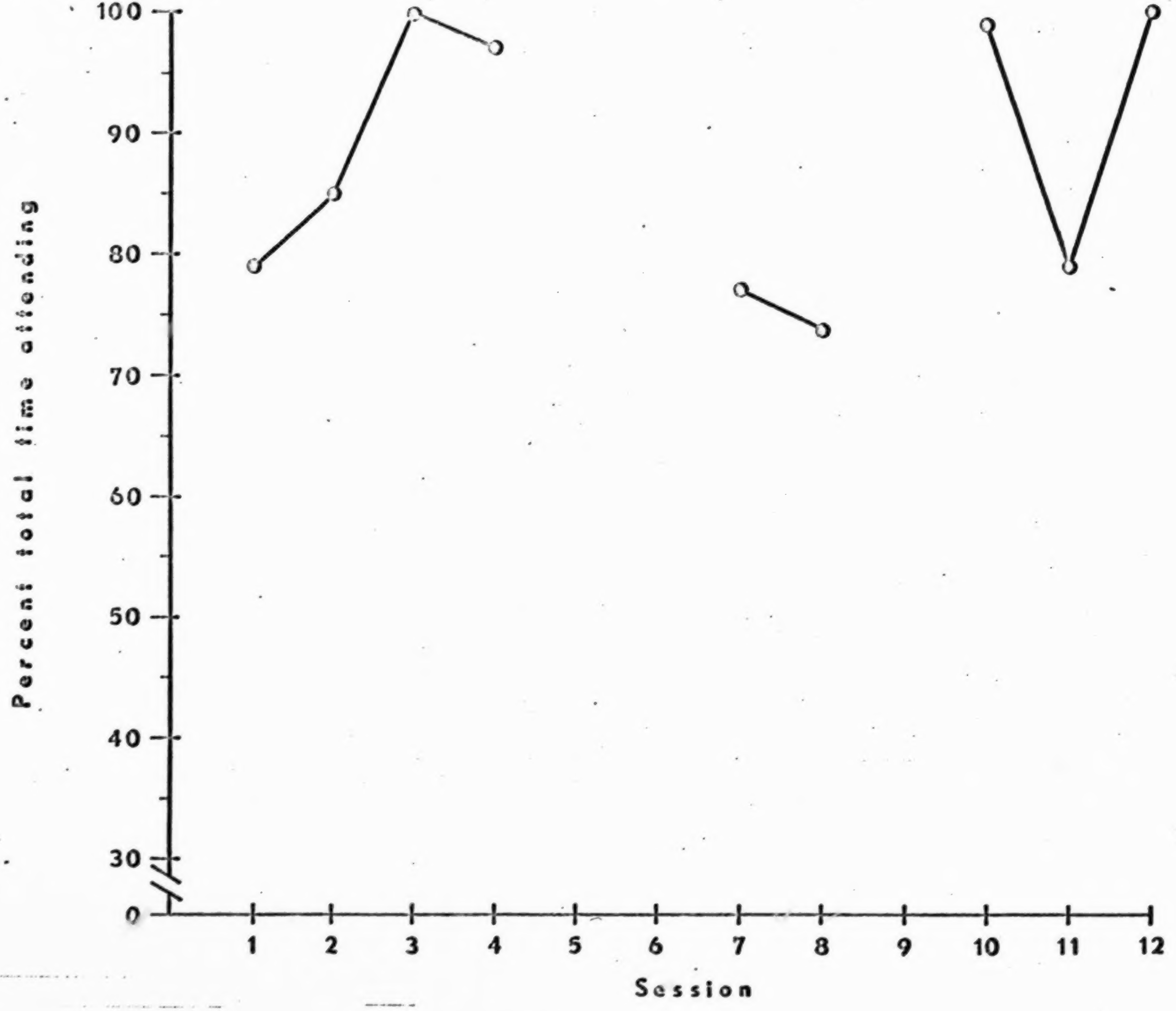


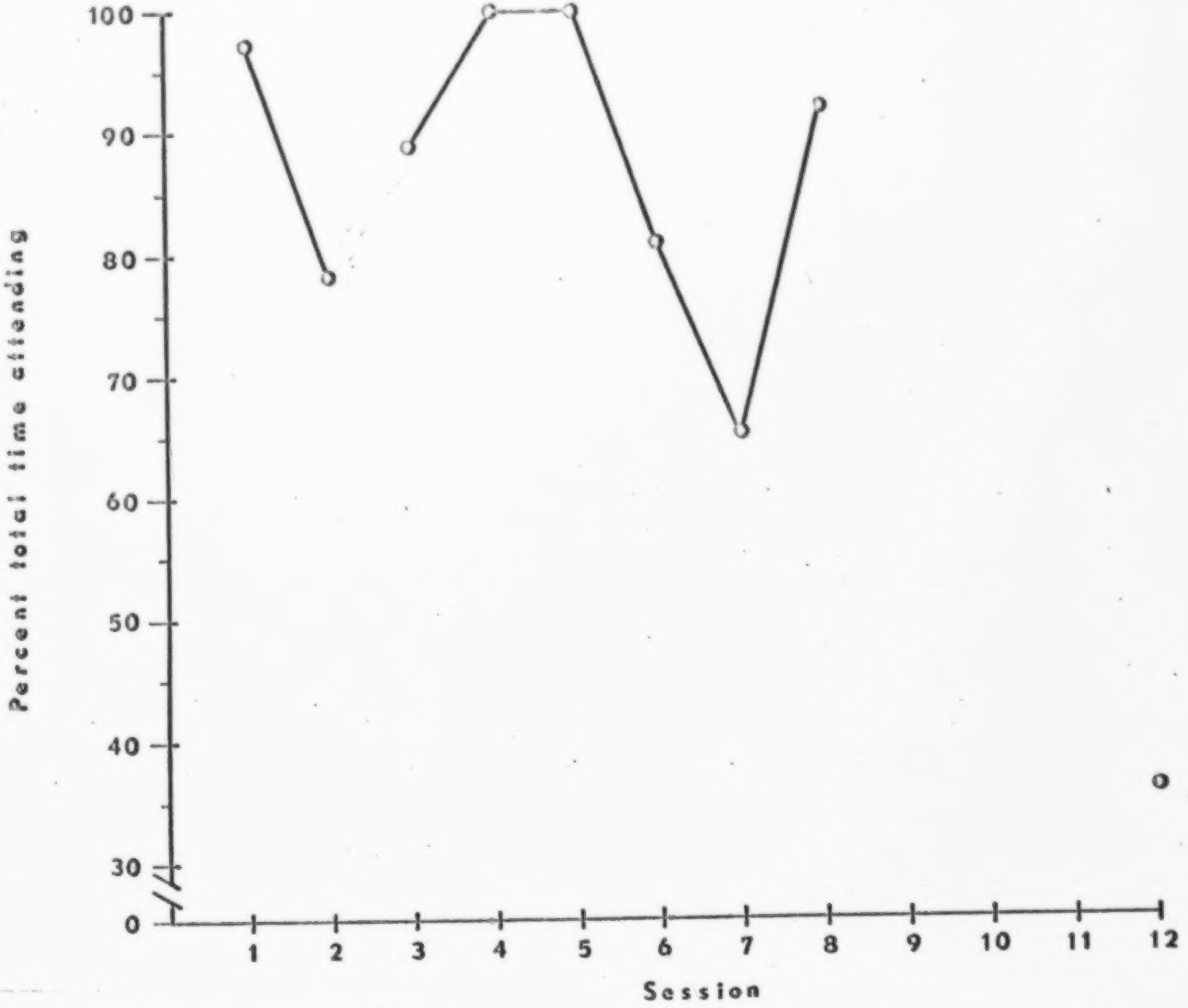
Figure 7.--Comparison of means and ranges of pre- and post- test scores for the experimental and the control group.

K&E 10 X 10 TO THE INCH 46 0700
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

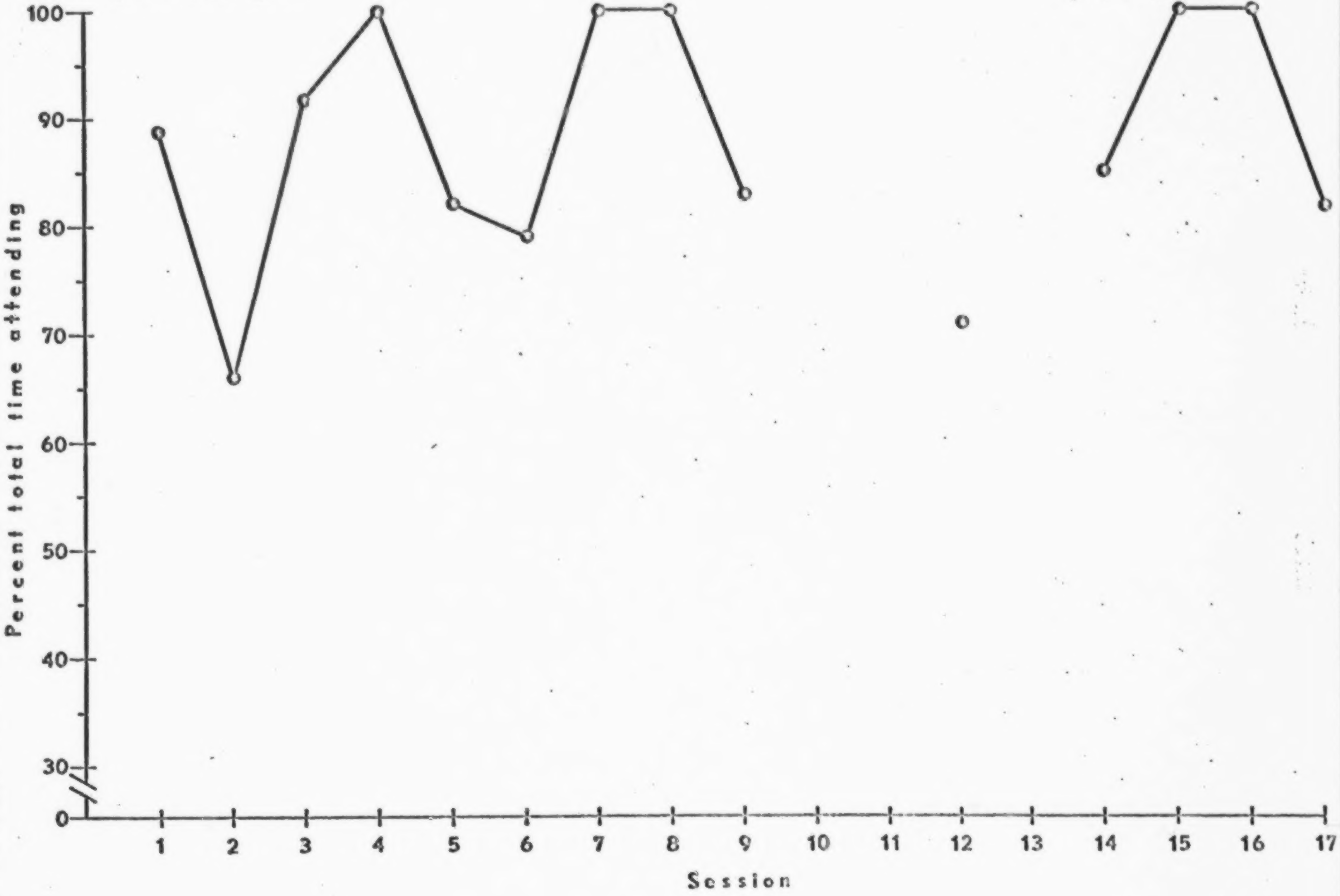
Percentage of each session during which child was attending to lesson: 4-year old girl



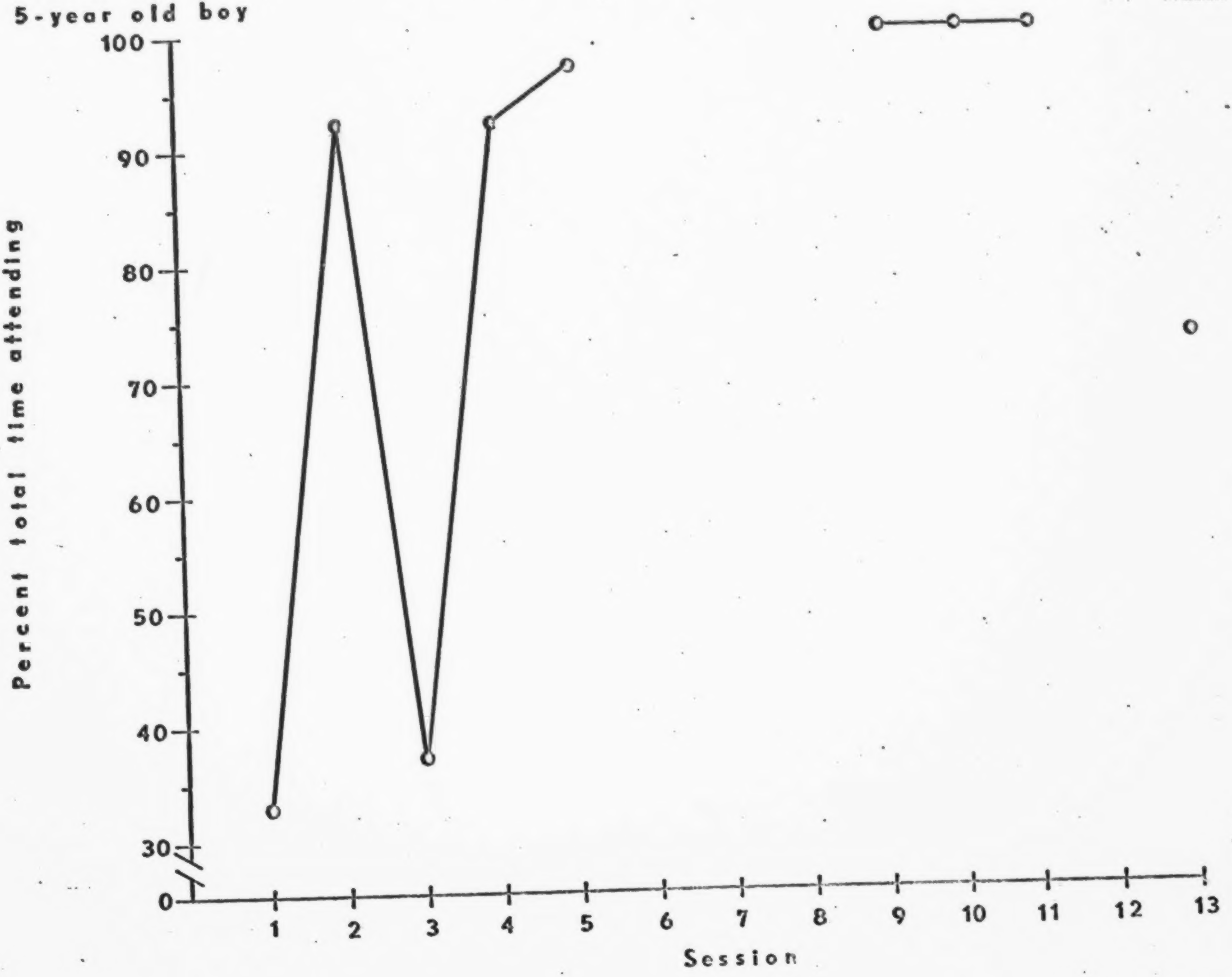
Percentage of each session during which child was attending to lesson: 4 year old negro boy



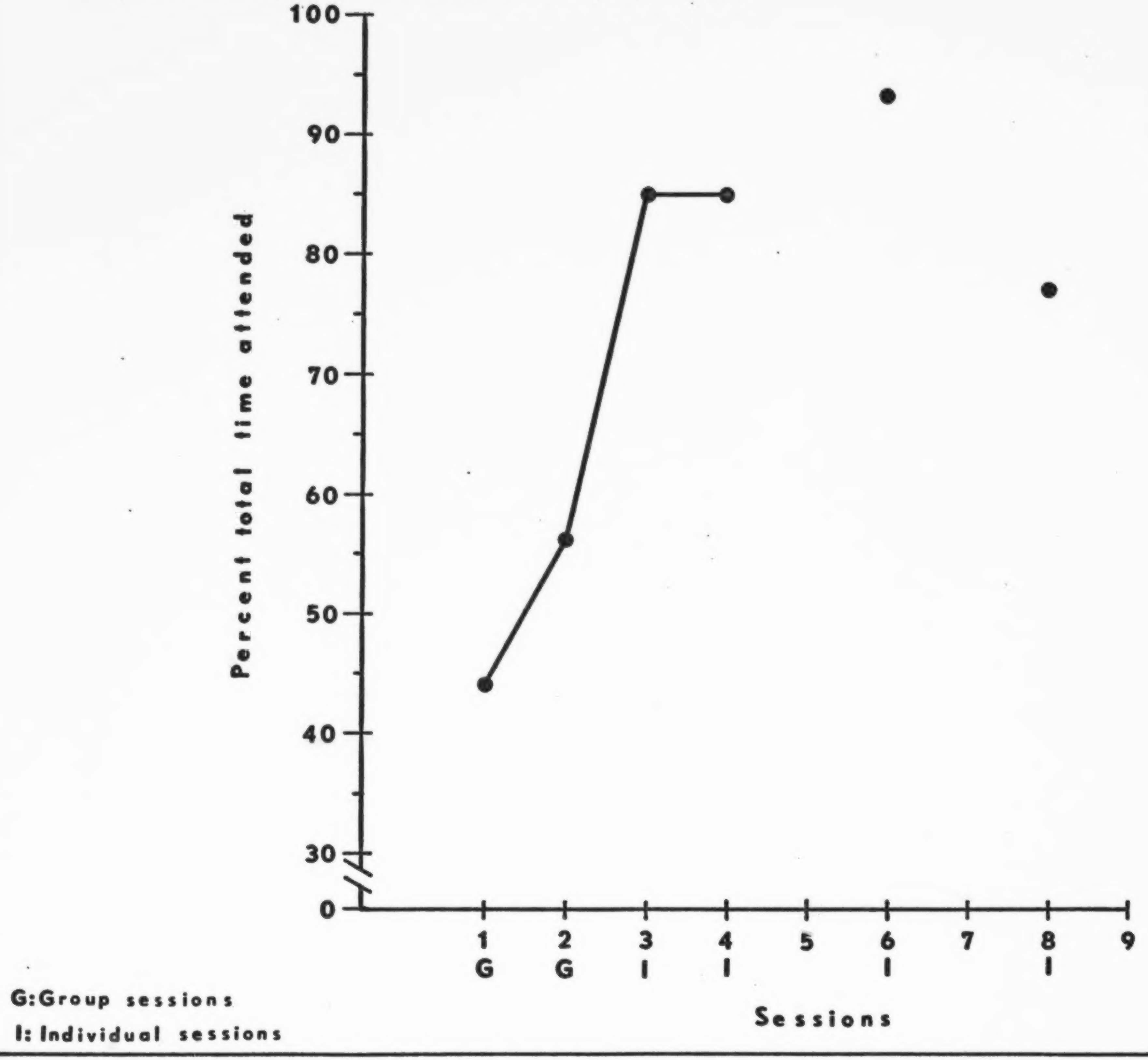
Percentage of each session during which child was attending to lesson:
5-year old girl



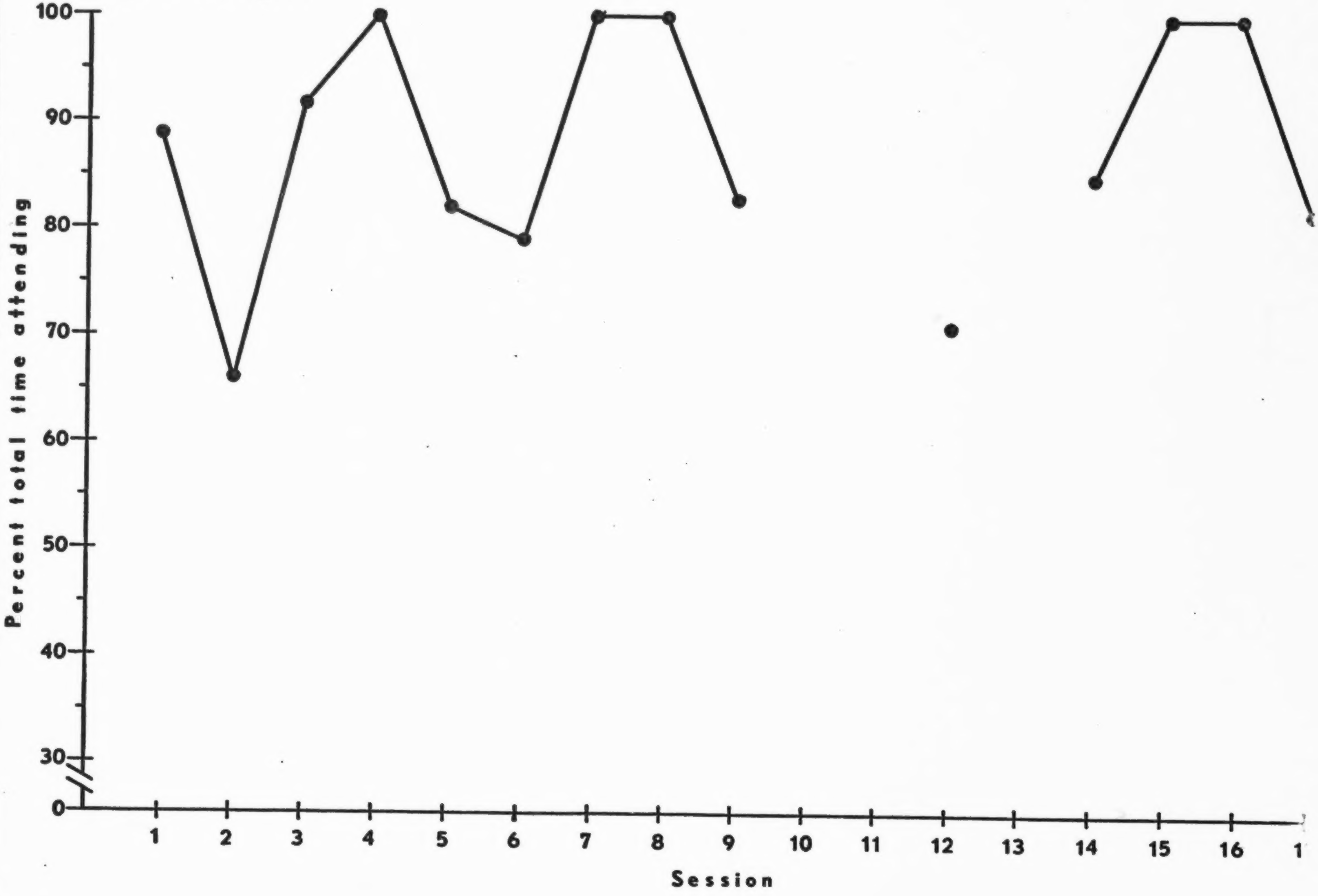
Percentage of each session during which child was attending to lesson:
5-year old boy



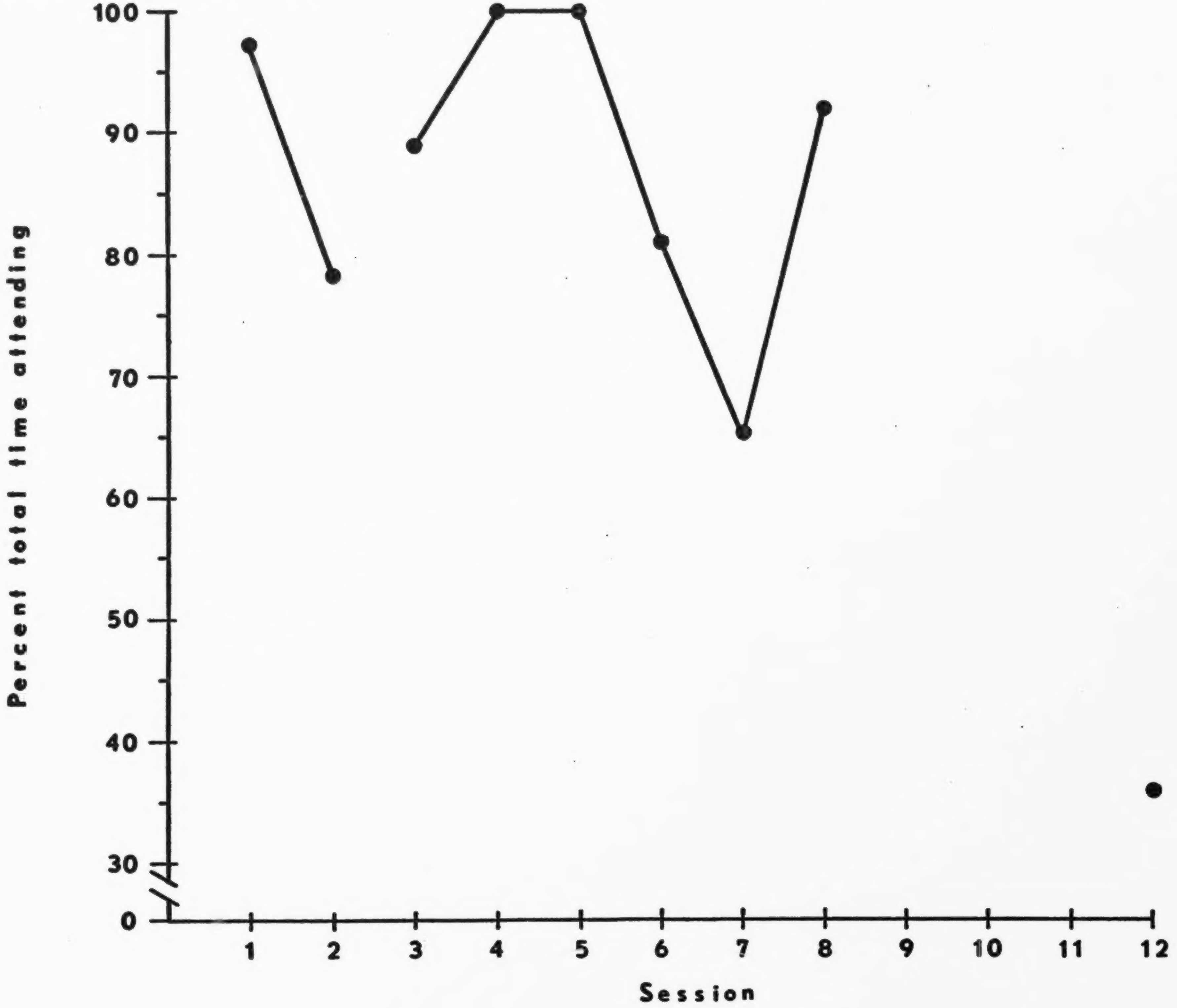
Percentage of each session during which child was attending to lessons: 5-year old girl with behavior problems



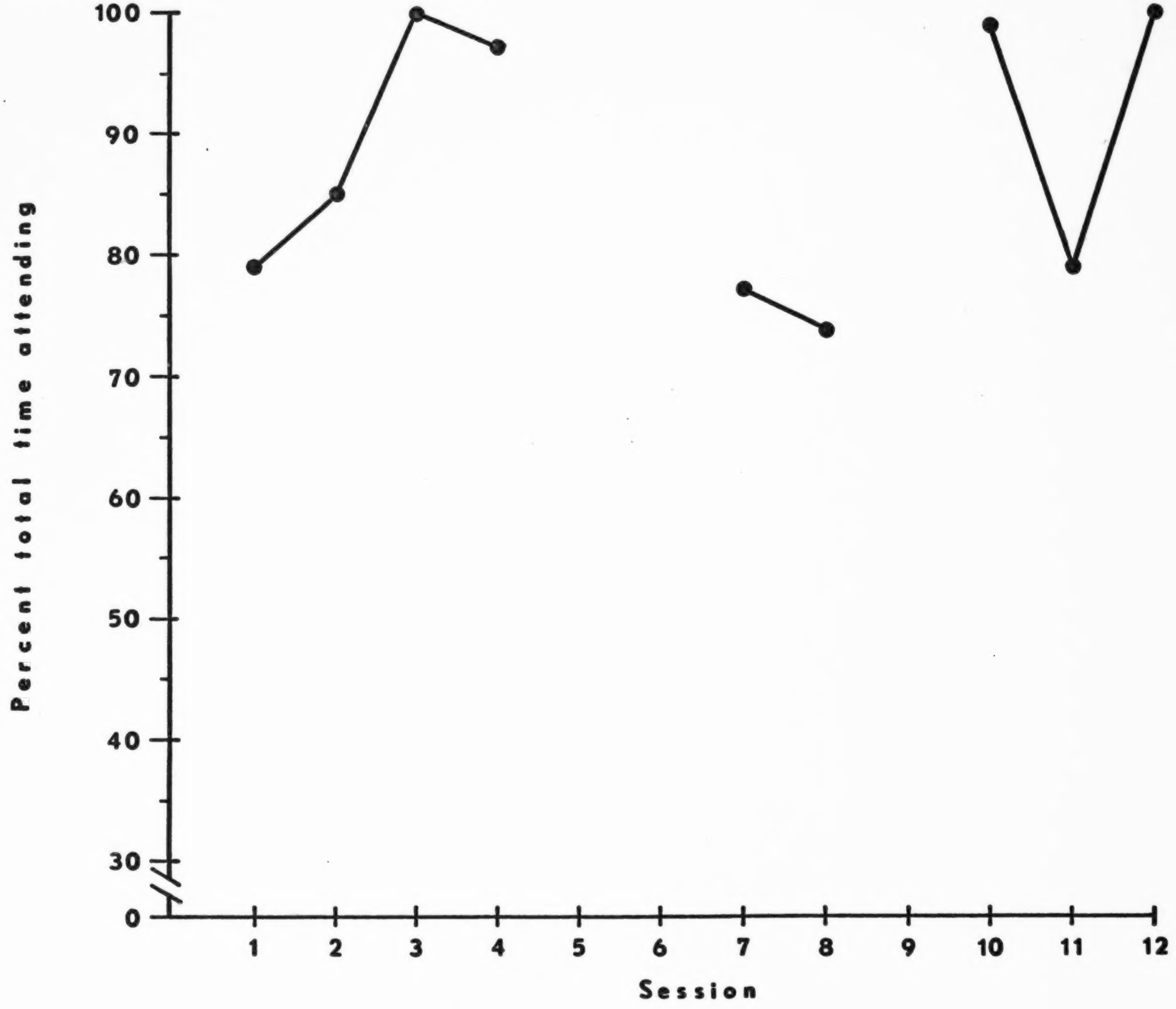
Percentage of each session during which child was attending to lesson: 5-year old girl



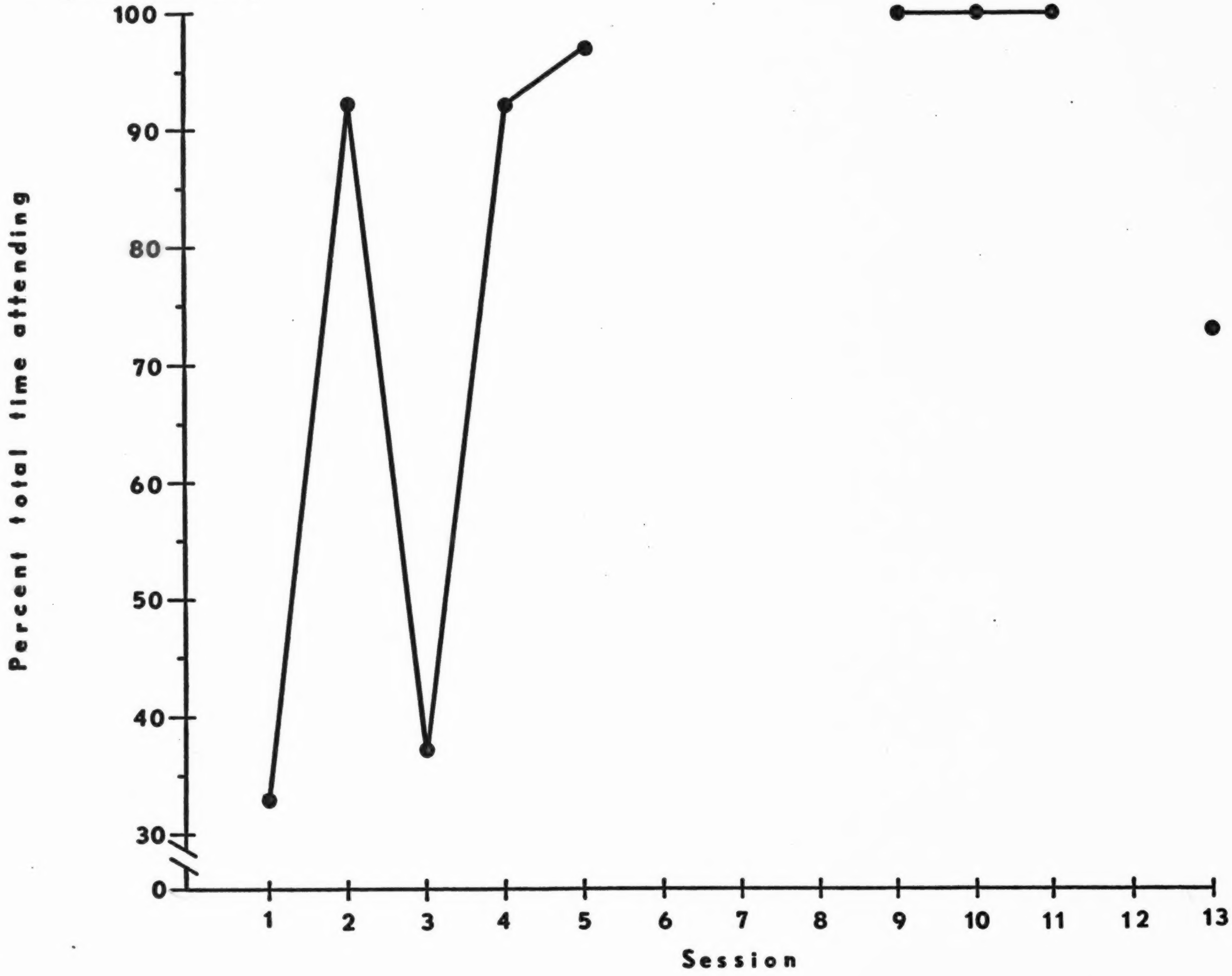
Percentage of each session during which child was attending to lesson: 4 year old negro boy



Percentage of each session during which child was attending to lesson: 4-year old girl



Percentage of each session during which child was attending to lesson: 5-year old boy



The University of Kansas Head Start Evaluation and Research Center

IV.

"A Comparison of Four Modes of Eliciting Brief Oral Responses from Children."

John V. Irwin, Ph.D.

Department of Speech Pathology

A Comparison of Four Modes of Eliciting Brief Oral Responses from Children[1]

John V. Irwin, Ph.D.
Department of Speech Pathology
University of Kansas

ABSTRACT

A 112 item articulation and vocabulary analysis was presented to 116 boys and girls who ranged in three month intervals from 4 years 6 months to 5 years 5 months inclusive. The stimulus modes of the four equivalent forms of the test were: (1) black and white prints, (2) color prints, (3) color transparencies, or (4) actual objects. The test was evaluated by mode of stimulation, age, and sex in terms of (1) word recognition, (2) latency of response, (3) articulation, and (4) subject preference. Mode of stimulation did not affect the variables studied, but the marked preference of the subjects was for the actual object. The performance of the children improved generally with age on the measures taken. Sex differences were not significant at these ages on these measures. An improved version of the test is being developed.

A Comparison of Four Modes of Eliciting Brief Oral Responses from Children

BACKGROUND

In obtaining samples of the vocabulary and articulatory responses of preschool children, the use of pictures or objects as speech eliciting stimuli is well established. Unfortunately, little experimental evidence is available with respect to the effects of variation in the mode of presentation of the stimuli. This project studied the effects of (1) item recognition, (2) response latency, (3) articulatory accuracy, and (4) subject preference of the following four modes of presenting the test stimuli: (1) actual objects, (2) color transparencies, (3) color prints, and (4) black and white prints.

PROCEDURE

Subjects

One hundred and thirty-three children form the Head Start Programs of Kansas City, Missouri, and Olathe, Kansas, were tested during the period from March 14, 1967, through May 16, 1967. These 133 children represented the total number actually present in the cooperating classes at the time of the testing.

The children were divided into four age groups of three months each. Age Group I ranged from 4 years, 6 months through 4 years, 8 months inclusive; Age Group II, from 4 years, 9 months through 11 months inclusive; Age Group III, from 5 years through 5 years, 2 months inclusive; and Age Group IV, from 5 years, 3 months through 5 months inclusive. Because of these limits, 13 children were dropped from the original 133. Table 1., The Distribution of the subjects by Age Group and Sex, summarizes these data.

Test Materials

Form I of The Multi-Modal Artivulation Analysis was used. This test consists of 112 one-word items selected (1) for frequency of occurrence and (2) for including collectively the vowels, diphthongs, consonants and common blends of American English in their usual phonetic positions. Four complete versions of this test (object, color slide, color print, and black and white print) were available.

Personnel

The actual field testing was accomplished by Mrs. Rita Beasley, Mrs. Bonnie Flemming, and Mr. Wallace Henning of the University of Kansas Head Start Evaluation and Research Center. These individuals were trained in the administration of the Multi-Modal Articulation Analysis by Mrs. Joan Draper, a research assistant on the project. Mrs. Beasley scored the responses on latency, word identification, and articulatory accuracy; either Mrs. Flemming or Mr. Henning, depending primarily on schedule, assisted in the test situation.

Techniques

The color transparencies were presented on a portable, manually controlled back projector. The child was seated comfortably in front of the screen. Both the color and black and white prints, which were approximately 4" square, were displayed individually to each child. Each object was displayed by the examiner but not actually given to the child.

Latency was timed with a stop watch from the moment of each stimulus presentation to the onset of the child's response. Values briefer than one second could not be recorded accurately.

Word recognition was scored by comparing actual responses against a prepared list; possible categories were: desired; synonym; wrong; and no response.

Articulation was evaluated for purposes of this portion of the total experiment as correct or incorrect. Evaluations were made by one highly trained listener.

Preference for mode of stimulation was established by asking the child to indicate, after having finished the complete test, which of the four modes he would choose in a repetition of the test.

Design

The 112 item Multi-Modal Articulation Analysis was administered to each child. The this experiment, the test was presented to each child in four consecutive segments of 28 items each. The mode of stimulation (black and white print, color print, color slide, or actral object) was systematically varied by segment for each child so that order and item effects could be controlled. The key variables of item recognition, latency, and articulation could then be studied by mode, age, and sex.

Because of the sampling procedure used, only descriptive statistics have been employed.

FINDINGS

Vocabulary

The essential data on vocabulary are displayed in Table 2. Mean Number of Vocabulary Responses by Category of Response, Age Group, and Sex, Table 3. Mean Number of Desired Word Responses by Age, Sex, and Mode of Presentation, and Table 4. Mean Number of Failures to Respond by Age, Sex, and Mode of Presentation.

In Table 2, the Desired Response category was defined as one in which the subject said the particular word sought. The category of Synonym Response was defined as a word different from the test word itself but as appropriate to the stimulus. The category of Wrong Response was defined as a word whose meaning was inappropriate to the stimulus. The category of No Response was defined as silence or as a failure to say any recognizable word. The category of Combined Response was defined as including the responses from both the Desired and Synonym categories.

Table 2 presents central tendency data only. For the 116 children of this study, the following general trends can be noted:

1. The ability to respond appropriately to the stimuli presented tends to increase for the age period studied whether efficiency is measured by a increase in the categories of Desired Synonym, and/or Combined, or by decreases in the categories of Wrong and No Response.
2. Little consistent sex difference can be observed in any of the five reported categories.
3. The vocabulary of the test falls within the ability range of the children.

Appendix I, Vocabulary Sulmary, presents frequency data for the 112 test words for all 133 children studied.

Table 3 is concerned with the effects of mode of presentation on vocabulary efficiency as measured by Desired Responses. Table 3 supports the general conclusion that item recognition by the children of this study is not strongly modified by mode of stimulation.

Table 4 is concerned with the effects of mode of presentation on vocabulary efficiency as measured by the category of No Response. These data also support the conclusion that mode of presentation is not a significant factor for these children.

High-quality, black and white or color prints, and high-quality slides seem to serve adequately as substitutes for the actual objects.

Latency

Table 5, Mean Latency in Seconds Per Response by Age, Sex, and Mode of Presentation presents central tendency data on latency. Latency was studied primarily because it has been suggented that this measure is related to the certainty and accuracy of stimulus recognition. Although wide range in latency was found, with isolated latencies of up to 60 seconds being recorded, latency as studied in this project did not vary importantly with make of presentation, age, or sex.

Preference

Table 6, Preference as Expressed for Mode of Presentation by Age Group and Sex in Number and Percentage of Choices presents central tendency data for mode choice. This table suggests the following conclusions:

1. For all age groups and both sexes, the objects tend to be preferred.
2. For all age groups and both sexes, black and white prints are generally the least liked.
3. Color may be the important choice factor.

The technique used in this investigation did not provide a measure of individual intensity of choice. At the moment, we have no reason to believe that this intensity is high.

Articulation

Table 7, Mean Number of Correct Articulatory Responses by Age Group and Sex presents central tendency data on articulation. Articulation was not studied by mode, although the data are available. Two general statements may be made relative to Table 7:

1. Articulatory ability as measured tends to increase for the the age groups studied.
2. Sex differences are small.

SUMMARY

This project has been analyzed primarily in terms of the testing media. A revision of the Multi-Modal Articulation Analysis is now being prepared. Major changes are:

1. Certain vocabulary items will be changed in the interests of greater recognizability.
2. The black and white prints and actual object versions of the test will be dropped; the color slide and color print versions will be retained.

It is planned to administer the revised test to a series of population samples.

FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.

TABLE 1. Distribution of subjects by age group and sex.

Age Group	Sex		Totals
	Boys	Girls	
I 4 years (6,7,8) months	14	18	32
II 4 years (9,10,11) months	14	14	28
III 5 years (0,1,2) months	13	18	31
IV 5 years (3,4,5) months	15	10	25
Totals	56	60	116

LE 2. Mean number of vocabulary responses by category of response, age group and sex.*

Boys						Girls						Total					
	Category of Response						Category of Response						Category of Response				
Number	Desired Response	Synonym	Combined Col. 1 and 2	Wrong Response	No Response	Number	Desired Response	Synonym	Combined Col. 1 and 2	Wrong Response	No Response	Number	Desired Responses	Synonym	Combined Col. 1 and 2	Wrong Response	No Response
14	72.6	8.3	80.9	18.5	12.6	18	71.2	9.3	80.5	16.7	14.83	32	71.8	8.9	80.7	17.4	13.84
14	78.8	9.0	87.8	14.9	9.2	14	74.7	10.3	85.0	13.0	14.0	28	76.8	9.6	86.5	14.0	12.0
13	81.3	9.5	90.8	14.9	6.3	18	78.6	8.0	86.6	14.7	10.7	31	79.7	8.6	88.3	14.8	8.8
15	80.9	9.8	90.7	12.7	8.6	10	75.6	8.0	83.6	15.6	12.8	25	78.8	9.0	87.8	13.8	10.2
56	78.41	9.16	87.57	15.21	9.21	60	75.0	8.93	83.93	15.03	13.05	116	76.64	9.04	85.68	15.12	11.19

ossible responses in four basic categories = 112.

E 3. Mean number of desired word responses by age, sex, and mode of presentation.*

	Boys						Girls						Total					
		Mode of Presentation						Mode of Presentation						Mode of Presentation				
	Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete
	14	17.71	17.92	18.50	18.42	72.57	18	18.50	18.11	16.50	18.11	71.22	32	18.15	18.03	17.37	18.25	71.81
	14	19.07	19.64	19.64	20.50	78.85	14	19.07	17.64	18.14	19.85	74.71	28	19.07	18.64	18.89	20.17	76.78
	13	20.46	20.53	20.00	20.30	81.30	18	20.16	19.27	19.38	19.83	78.66	31	20.29	19.80	19.64	20.03	79.77
	15	20.46	19.66	20.26	20.53	80.93	10	18.50	17.90	18.50	20.70	75.60	25	19.68	18.96	19.56	20.60	78.80
E.	56	19.42	19.42	19.60	19.94	78.41	60	19.13	18.31	18.08	19.46	75.50	116	19.27	18.85	18.81	19.69	76.64

ossible score for each test segment = 28; for total test = 112.

4. Mean number of failures to respond by age, sex, and mode of presentation.*

Boys						Girls						Total					
	Mode of Presentation						Mode of Presentation						Mode of Presentation				
Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete
14	3.50	3.07	2.28	3.71	12.57	18	2.94	4.05	4.11	3.72	14.83	32	3.18	3.62	3.31	3.71	13.84
14	2.78	1.92	2.42	2.07	9.21	14	2.71	5.14	4.07	2.07	14.00	28	2.75	3.53	3.25	2.07	11.60
13	1.61	1.38	2.00	1.30	6.30	18	2.00	2.72	3.22	2.72	10.66	31	1.83	2.16	2.70	2.12	8.83
15	2.46	2.60	1.93	1.60	8.60	10	3.40	3.80	2.90	2.70	12.80	25	2.84	3.08	2.32	2.04	10.28
56	2.60	2.26	2.16	2.17	9.21	60	2.68	3.86	3.63	2.86	13.05	116	2.64	3.09	2.92	2.53	11.19

ossible responses for each test segment = 28; for total test = 112.

E 5. Mean latency in seconds per response by age, sex, and mode of presentation.

Boys						Girls						Total					
	Mode of Presentation						Mode of Presentation						Mode of Presentation				
Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete	Number	Black and White	Color Pictures	Color Slides	Objects	Complete
14	7.06	6.89	6.15	6.61	6.67	18	6.28	6.51	6.74	6.32	6.50	32	6.62	6.67	6.48	6.45	6.55
14	6.11	6.24	6.07	6.11	6.13	14	7.53	8.80	7.49	6.88	7.67	28	6.82	7.52	6.78	6.49	6.90
13	5.53	5.95	5.50	6.03	5.75	18	5.43	5.75	5.88	6.10	5.79	31	5.47	5.84	5.72	6.07	5.77
15	5.63	5.77	6.02	5.49	5.72	10	6.69	6.44	6.32	5.96	6.35	25	6.05	6.03	6.14	5.68	5.97
56	6.08	6.21	5.94	6.05	6.07	60	6.38	6.80	6.59	6.32	6.52	116	6.24	6.52	6.28	6.19	6.30

TABLE 6. Preference as expressed for mode of presentation by age group and sex in number and percentage of choices.

	Boys					Girls					Total				
		Mode of Presentation					Mode of Presentation					Mode of Presentation			
Age Group	Number	Black and White	Color Pictures	Color Slides	Objects	Number	Black and White	Color Pictures	Color Slides	Objects	Number	Black and White	Color Pictures	Color Slides	Objects
I	14	0 0%	4 28%	2 14%	8 57%	18	2 11%	6 33%	4 22%	6 33%	32	2 6%	10 31%	6 18%	14 44%
II	14	1 7%	5 36%	3 21%	5 36%	14	0 0%	5 36%	3 21%	6 43%	28	1 3%	10 36%	6 21%	11 39%
III	13	0 0%	1 8%	4 31%	8 61%	18	0 0%	5 28%	2 11%	11 61%	31	0 0%	6 19%	6 19%	19 61%
IV	15	1 7%	4 27%	2 13%	8 53%	10	2 20%	3 30%	2 20%	3 30%	25	3 12%	7 28%	4 16%	11 44%
Tot.	56	2 3%	14 25%	11 20%	29 52%	60	4 7%	19 32%	11 18%	26 43%	116	6 5%	33 28%	22 19%	55 47%

TABLE 7. Mean number of correct articulatory responses by age group and sex.*

Age Group	Number	Boys	Number	Girls	Number	Combined
I	14	78.00 69%	18	80.00 71%	32	79.20 70%
II	14	85.00 75%	14	83.5 74%	28	84.20 75%
III	13	90.4 80%	18	89.8 80%	31	90.00 80%
IV	15	85.7 76%	10	93.6 83%	25	88.90 79%

*possible number = 112

Appendix I. Cummulative errors in word recognition for 133 children.

shoe	1
chair	1
spoon	1
pen/pencil	1
glasses	2
comb	2
airplane/plane	3
gun	3
hat	3
hammer	4
apple	4
scissors	4
santa claus	5
car	5
pins	6
boat	6
knife	7
fork	8
bottle	8
record	9
train	9
candy	9
table	9
bathtub	11
telephone	11
bed	11
whistle	11
wagon	11
ball/baseball	12
toothbrush	13
coins/pennies/ money	13
three	13
dog	14
blocks	16
dress	16
one	17
cup	19
box	19
thumb	20
bus	20
wristwatch/watch	20
key	21
glass	21
brush	22
nose	22
matches	22
clown	22
stove	23
book	24
potatoe	24
milk	24
egg	25
banana	27
swinging	28
ring	28
soap	29
crayons	30
basket	33
mouth	35
screwdriver	35
boot	38
turtle	39
cat	40
bat	43
sleeping	43
bread	43
boy	43
snake	44
ladder	44
jumprope	46
grapes	46
star	47
zipper	50
baby	50
quack	51
pan	51
this/that	52
skate	55
present	57
witch	57
smile/smell	58
bucket	59
yo-yo	60
doghouse	61
shovel	61
jar/jam/jelly	63
flashlight	65
ties	66
squirrel	69
mouse	73
can	74
feather	74
fan	75
sponge	77
yellow	80
sidewalk	81
pipe	81
saw	82
refrigerator	93
rake	98
letter	100
lock	102
dishes	106
strawberries	106
fruit	107
vacuum/cleaner	108
measuring	109
ice cube	124
mitten	125
twins	127
pitcher	131
sprinkling can	134

The University of Kansas Head Start Evaluation and Research Center

V.

"A Comparative Behavioral Analysis of Peer-Group Influence Techniques in Head Start and Middle Class Populations."

Howard Rosenfeld, Ph.D.

Department of Psychology

INFLUENCE TECHNIQUES IN DYADS COMPOSED OF INTERDEPENDENT MIDDLE AND LOWER CLASS PRESCHOOL CHILDREN

HOWARD M. ROSENFELD, PH.D. [2]

Associate Professor, Department of Psychology;
Research Associate, Bureau of Child Research

RICHARD L. RUSSELL, M.A.

Research Assistant, Bureau of Child Research

The University of Kansas
Lawrence, Kansas 66044

Final Report: Project 35
Head Start Evaluation and Research Center
The University of Kansas

August 31, 1967

ABSTRACT

Influence Techniques in Dyads Composed of Interdependent Middle and Lower Class Preschool Children[1]

Howard M. Rosenfeld and Richard L. Russell

The University of Kansas

The procedures by which children from lower and middle class backgrounds attempt to obtain rewarding outcomes from each other were observed under semicontrolled conditions. 10 male and 9 female dyads, each composed of 1 middle class and 1 lower class preschool child, were required to complete 12 simple block puzzles in which each was given some of the pieces his partner needed. Rewards were given for cooperative or competitive performance, each for 6 consecutive puzzles. Ss in the 2 socioeconomic groups demonstrated similar behavioral repertoires. Their behavior usually involved the physical manipulation of puzzle pieces, rather than attempts to influence their partners. About 3/4 of all observed interpersonal acts could be categorized into taking, delivering, and demanding puzzle parts. Visual attention was directed primarily toward own puzzle parts and secondarily toward the partner. Middle class Ss were more successful in general, but their demands were complied with less than were those of lower class Ss. When competitive conditions were first, Ss emitted more acts in both payoff conditions than when cooperation was first. This effect was strongest among lower class girls, possibly because of dominance of female models in the lower class home environment. A followup study on 2 very low performing lower class subjects revealed that their responsiveness increased greatly when paired with familiar lower class partners in their own preschool environment.

Influence Techniques in Dyads Composed of Interdependent Middle and Lower Class Preschool Children

Psychologists recently have shown increasing interest in the phenomenon of cultural deprivation and in the related problems of the social, emotional, and cognitive development of children from extremely low income families. Much of this interest is based upon the assumption that children from these families are in some way different from their middle class counterparts. Many studies have discovered differences in I.Q., level of conceptual ability, and other facets of the mental functioning of these children (see, for example, Eisenberg & Conners, 1966; Siegel, Anderson, & Shapiro, 1966; and Waller & Conners, 1966). Few studies, however, have attempted to compare directly potentially significant aspects of the overt behavior of lower class children with those of middle class children.

Given the increasing upward mobility of lower socioeconomic groups and the trend toward more integrated schools, it is especially important that children from lower income families be capable of competing effectively with middle class peers. Of particular interest are children in Project Head Start and similar poverty-related preschool programs in which relatively strict criteria for admission make the group socioeconomically homogeneous. The present study was designed to compare the behavorial techniques used by middle and lower class preschool children in situations which required them to cooperate or compete with each other in order to obtain rewards.

The major independent variable was socioeconomic class of the subject (S). Sex of S, task payoff designed to encourage cooperative or competitive problem solving, and order of receiving the payoff conditions (cooperative-competitive and competitive-cooperative) were cross-classified as independent variables in the expectation that they might qualify the effects of social class.

A follow-up study also was performed on two dyads in which the lower class members had exhibited extremely low rates of performance (few task-relevant responses) in order to determine whether the lower class members were generally unresponsive or whether they were failing to respond to middle class peers in particular. In an earlier study it was found that response deficiencies of Head Start children in middle class teaching situations tended to be much greater in initial sessions than in repeated exposures (Horowitz & Rosenfeld, 1966). The current follow-up study also included a condition which tested the validity of this explanation of the observed response deficiencies of the lower class members of the dyads.

Method

Subjects

Ss were drawn from three nursery school populations. Middle class (MC) Ss came from the afternoon session of the University of Kansas Preschool. These children come predominantly from the homes of faculty members, and a majority of them have had one year of previous preschool experience. They attend their preschool three hours per day, four days per week. Lower class (LC) Ss were selected from two Lawrence, Kansas nursery schools, here labeled NS-1 and NS-2. NS-1 is supported by Project Head Start, and is attended solely by children from families whose annual income does not exceed $3,000. Children attended NS-1 seven hours per day, five days per week. NS-2 was supported by community funds when this study was conducted. Approximately 10% of the population in NS-2 come from families whose annual income exceeds $3,000. However, only Ss whose family income is less than $3,000 were used in the experiment. Each child in NS-2 attended school three hours per day, two days per week.

On the basis of their performance on the pretest described below under "familiarization session," 19 dyads were formed, each containing one member of each socioeconomic group. Ten of the dyads were composed of male Ss, and nine of female Ss. The average age, age range, and ethnic class memberships of the Ss in each population are given in Table 1.

Table 1 about here

Experimental Setting

The experimental setting was designed to maximize two conditions. First, the setting had to permit a range of behaviors resembling that found in the school environment. Second, the setting had to permit reliable observation of those behaviors. A semistructured experimental approach was devised which kept constant such environmental features as room, experimental personnel, and task. Within this constant setting, however, the behavior of the Ss was relatively unrestricted.

Puzzle Task

The puzzle-making task required each S to complete 12 successive puzzles. Each puzzle consisted of an 8"x10" sheet of cardboard, upon which was pasted a design composed of four adjacent paper geometric forms. The forms used squares, parallelograms, and triangles. The squares were either red or green, triangles were blue or yellow, and parallelograms were yellow, blue, orange, or purple. The geometric forms matched the shapes and colors of Playschool Parquetry Blocks.

On each of the 12 trials, each S was given a puzzle card and four blocks and was instructed to place blocks on his puzzle card, matching both color and shape. Subjects received indentical puzzle cards per trial; however, two of the blocks given to each S were needed by the other S to complete his puzzle. Thus, it was necessary for the Ss to exchange blocks in order to complete their puzzles. All Ss received the puzzle cards in the same random order.

Payoff Conditions

Each pair of Ss was tested under both cooperative and competitive payoff conditions. The cooperative condition required both Ss to complete their puzzles correctly prior to the sounding of a buzzer in order to receive plastic trinkets. To reinforce verbal instructions to this effect, the buzzer was activated such that all Ss won the first cooperative trial and lost the second. The outcome of the next four trials was determined by the Ss' performance on those trials, as the buzzer was activated by a timer set to the mean of the times required by the Ss to complete their puzzles on the second cooperative trial. Under the competitive condition only the S who finished first on each trial was rewarded. Ten dyads received the cooperative condition first and nine received the competitive condition first. Assignment of dyads to the two orders of conditions was random. All Ss were given a small toy at the end of the experimental session.

Procedure

Familiarization Task. All Ss who met the economic criterion and who were approximately 4 to 5 years of age were given a pretest which determined whether or not they were able to master the puzzle task. To minimize the potentially detrimental effect of an unfamiliar setting, as well as to familiarize the Ss with the research staff, the pretests were conducted in the buildings where the Ss normally attended school. Pairs of Ss within each nursery school population were tested on a series of six puzzles similar to those to be used in the subsequent testing situation. The pretest puzzles represented a series of tasks of increasing difficulty. The first pretest puzzle required only that each S place one red and one green square block on his matching puzzle card. The last two pretest puzzles were of the same order of difficulty as the puzzles of the experimental task. Subjects who could not be induced to play the game were eliminated from the sample. All MC Ss mastered the tasks. Two children from NS-1 and one from NS-2 did not.

The pretest also served as an opportunity to teach the Ss the rudiments of the puzzle game. The Ss were taught that their blocks had to be placed on the parts of the puzzle corresponding to them in color and shape in order to be rewarded. They also were shown that the other S had some of the blocks that they needed. Great care was taken not to influence the specific methods by which Ss obtained the blocks they needed or to induce a cooperative set. That is, Ss were never informed that they were to give any blocks to their partners. They were prompted, if necessary, to get from their partners the blocks they needed. Thus, the final sample consisted of Ss who already had learned how to do the puzzles. This restriction fit the major aim of discovering how subjects went about obtaining parts from each other, rather than studying their individual abilities to put puzzles together.

Experimental Sessions. Two pairs of Ss were tested each day. The required four Ss were brought together by taxicab, accompanied by a familiar project assistant, to the Social Interaction Laboratory at the Bureau of Child Research. The two Ss who were not being studied at any given time played together with the assistant in a playroom. These two Ss could be observed from an observation room located between the playroom and experimental room. Care was taken to insure that the play activities of these Ss were constant across pairs and largely irrelevant to the activities in the testing situation.

During the experiment the Ss were seated at opposite sides of a four foot diameter table placed in the approximate center of a 13 by 15 foot room. A female experimenter (E) was seated between the Ss. The duties of the E consisted of distributing and collecting puzzle materials, rewarding the Ss appropriately, and maintaining order. She interacted with the Ss as little as possible, while still remaining warm and permissive. Two observers (Os) observed the Ss through a one-way window from the observation room.

After the Ss had entered the room and seated themselves at the table, the E explained the nature of the task and the payoff conditions under which it was to be played. An effort was made to determine whether the Ss had understood the instructions by questioning them about the payoff conditions. The majority of the Ss appeared to understand their instructions, in the sense that they were able to verbalize the conditions under which they would be rewarded.

The E then administered the six puzzles under the first payoff condition. Next, the E explained the payoff conditions for the second set of six puzzles and again attempted to elicit verbal responses indicating comprehension of the instructions. The second set of six puzzles was then administered. Following the completion of this series, the Ss were given two additional puzzles with no time limits and were rewarded merely for completing them. The Ss' responses were not scored on these final trials. The Ss then were given a toy and taken to the playroom while the second dyad was run. The procedure for the second dyad was identical to that for the first.

Dependent Variables

The two Os recorded the content of the interaction between the Ss in the experiment, the locus of their visual orientation, and the amount of time each S took to complete each puzzle. To score the content of interaction, a system of behavorial categories was employed. These categories were established during the pretest trials and were designed to encompass all task-relevant behavior. The categories and their behavorial descriptions are outlined below.

I. DEMAND. A demand was scored whenever one S requested a puzzle piece from the other S.

  A. Verbal. One S verbally requested a puzzle piece from the other S.

    1. Rewarding. The demand implied approval or reward contingent upon compliance with the demand.

    2. Punishing. The demand implied punishment or disapproval contingent upon the S's failure to comply.

    3. Bargaining. One S offered to give the other S a piece if the other S would give him one.

    4. Other. All verbal demands which are not scored as Rewarding, Punishing, or Bargaining.

  B. Nonverbal. A demand employing gestures.

    1. Reaching. A gesture in which the S's hands moved rapidly toward the other S, palm up, all fingers extended.

    2. Pointing. The S pointed to the puzzle piece he wanted, palm down, finger extended, hand relatively steady.

II. TAKE. One S manually obtained a puzzle piece from the other S's set, without the latter's help.

III. COMPLY. One S responded to the other S's demand.

  A. Verbal. One S responded verbally to the other S's demand.

1. Agreeing. The S stated he would comply with the demand of the other S.
2. Refusing. The S stated that he would not comply with the other S's demand.
3. Bargaining. The S made a bargaining demand in response to the other S's demand.

B. Nonverbal. One S responded nonverbally to the other S's demand.

1. Delivery. The S gave a piece to the other S in response to that S's demand.
2. Resistance. The S physically prevented the other S from taking a puzzle piece from him.

IV. OFFER. One S gave a piece to the other S or asked the other S if he needed a piece, without this action being preceded by a demand from the other S.

A. Verbal. One S asked the other S whether he needed a piece.

B. Nonverbal. One S gave a piece to the other S.

V. GIVE INFORMATION. One S gave the other S information about the second S's puzzle or about his own puzzle.

A. Verbal. The S gave information verbally.

B. Nonverbal. The S gave information by gesturing.

VI. REINFORCING-PUNISHING CONTINGENCIES. One S indicated approval or disapproval following the other S's behavior.

A. Verbal. The S used verbal media to communicate approval or disapproval.

1. Positive. The S indicated approval of the other S's action.

B. Nonverbal. One S used nonverbal means to communicate approval or disapproval.

1. Positive. The S indicated approval of the other S's action.

2. Negative. The S indicated desapproval of the other S's action.

On each trial, one of the Os recorded behavior by speaking its code name into a dictaphone and indicating which S had produced the behavior. The content of the interaction was observed an equal number of times under each condition by each O. Usually the Os alternated trials; however, the assignment of tasks to the Os occasionally made it necessary for one O to observe two consecutive trials. Both Os simultaneously observed interaction during one trial each session in order to estimate reliability of observation.

Eye orientation (EO) was scored using a time sampling procedure. One of the Os recorded the locus of EO of one of the Ss every five seconds. The moment at which the S was to be observed was indicated by a light mounted in front of the Os, which was activated by a recycling timer. Scoring began at the time the Ss received their puzzle pieces and ended at the time the S being observed finished placing the correct pieces on his puzzle card.

The S was scored as looking in one of the four following loci: (1) at his own puzzle materials (Own); (2) at his partner or at his partner's puzzle pieces (P); (3) at the experimenter (E); or (4) at anything else (Other).

The *O*s recorded the locus of gaze by pressing one of four piano-type switches which were connected to electrical counters. The counter readings were recorded on the dictaphone at the end of each trial.

The EO of only one *S* was observed each trial. *S*s were usually observed alternately on alternate trials; however, as with interaction, the assignment of tasks to *O*s occasionally required that one *S* be observed on two consecutive trials. Also, as with interaction, each *S* was observed an equal number of times by each *O* under each experimental condition. One *S* was observed simultaneously on one trial each session for EO reliability purposes.

The time it took each *S* to complete each task was recorded by the use of stopwatches. One *O* was assigned to one *S* and the other *O* to the other *S* for the duration of each session. The watches were started simultaneously by the *O*s when the *S*s were handed their puzzle pieces. Each observer stopped timing as soon as the *S* whom he was observing placed his or her last piece on the puzzle.

Results

Distribution of responses across categories

Approximately 90 percent of the observed task-relevant behavior was scored in four general categories: (1) *demand* (other and reaching), (2) *take*, (3) *comply* (deliver), and (4) *offer* (nonverbal). The frequency with which behaviors were recorded in each of these categories for each social class is listed in Table 2. Statistical analyses of these four categories as dependent variables appear below. Other categories were not analyzed due to the infrequent occurrence of their referents.

Table 2 about here

Observer reliability

An index of observer reliability was calculated for each of the four behavorial categories listed above by dividing twice the number of occasions upon which the *Os* agreed upon the occurrence of the given behavior by the total number of times that each observed it. Indices of agreement ranged from 0.88 to 1.00, with an average of 0.95. The similarly computed average reliability index for observation of direction of gaze was 0.91.

Interaction content

The frequencies of occurrence of some of the four behavorial categories were significantly correlated with the number of total acts. To eliminate this confounding, proportion scores were derived for each category from the frequency scores of each *S* by dividing the frequency of occurrence of the referent behavior of a category by the total number of acts emitted by that *S*. The proportion scores were converted to arcsin scores to normalize their distributions. After inspection indicated that their distributions were normal, each proportion score, as well as the total number of task-relevant behaviors, was subjected to an analysis of variance. The principle source variables were social class (middle vs. lower), sex, payoff condition (cooperative vs. competitive), and order of conditions (cooperative first vs. competitive first).

Table 3 about here

This means involved in the analyses of variance appear in Table 3. The summary of each analysis is reported in Table 4. All p values refer to two-tail tests. The analysis of total task-relevant responses revealed effects of sex and of order of conditions, each beyond the .10 level of confidence, and an interaction between social class, sex, and condition order beyond the .05 level. Girls emitted more acts than did boys, and *S*s who received the competitive condition first emitted more responses (across both payoff conditions) than did those who received the cooperative condition first. Multiple comparison tests of the means involved in the three-way interaction indicated that the effect was primarily due to the very high frequency of responses of lower class girls in the competition-first condition. It also should be noted that the two lower class groups differed from each other. *S*s in NS-1 emitted approximately twice as many task-relevant responses as did those in NS-2 (p .05). Classification of all task-relevant responses into verbal and nonverbal types revealed no social class difference in the ratio of verbal to nonverbal acts.

Table 4 about here

The analysis of *demands* revealed a significant main effect of order of conditions and a significant interaction between payoff condition and order of conditions, both beyond the .01 level. *S*s demanded more during the first payoff condition than during the second; however, those *S*s who received the competitive condition first demanded more under both competitive and cooperative payoff than did those who received the cooperative condition first. MC *S*s complied with 37% of LC demands. LC *S*s complied with 38% of MC demands.

The major determinant of variance in *taking* was social class (p .05). Middle class *Ss* took more puzzle parts from their lower class peers than the latter took from them. Several other effects and interactions were obtained beyond the .10 level. The most significant source of these rather weak findings was the higher proportion of taking when the cooperative condition was first than when the competitive condition was first.

Social class affected *offers* at the .10 level. MC *Ss* initiated more deliveries of puzzle parts than did LC *Ss*. The interaction of social class with sex and order of payoff conditions, significant beyond the .01 level, was due primarily to more offering by the MC girls in the cooperative-first group than by MC girls in the competitive-first group, and by more offering by the MC males in the competitive-first group than by any other MC males.

The frequencies with which the members of each dyad emitted *demands*, *takes*, and *offers*, were uncorrelated, as were their numbers of total acts.

Visual Orientation

The number of times each *S* was scored as looking at each locus was divided by the total number of times the eye orientation (EO) of that *S* was recorded, in order to determine the proportion of time the *Ss* spent looking at each locus. The socioeconomic groups did not differ in the proportion of time allocated to each of the four loci. *Ss* in both groups spent about 67% of the task time looking at their own puzzle materials (*Own*), about 27% looking at their partners (*P*), and about 6% looking at the experimenter or at other stimuli (*E* and *Other*). Because of the small number of responses falling into the *E* and *Other* categories, it was felt that the *P* and *Own* percentages were confounded (inversely related) to such an extent that analysis of only one of them would suffice. The P category was chosen for analysis. The reverse of conclusions made about P obtain for Own.

The P proportion scores were subjected to an arcsin transformation to normalize their distribution. They were then submitted to an analysis of variance with the same source variables as were employed above. This analysis, presented in Tables 5 and 6, indicates significant effects of condition order, payoff condition x condition order, and social class x payoff condition x condition order. An examination of the means of the condition order groups revealed that Ss in the competitive-first group directed approximately one and one half times as much eye orientation toward P (EO-P) as did Ss in the cooperative-first group. Also the EO-P of MC Ss decreased markedly across the two halves of the session, while that of LC Ss did so only very slightly.

Tables 5 and 6 about here

Correlation coefficients were calculated to determine whether relationships existed between the proportion of EO-P and the frequencies of the task-relevant behaviors emitted by Ss under all conditions was significantly related to the proportion of EO-P of these Ss (r = .48, p .01). When the two condition order groups were examined competitive-first group (r = .52, p .02) but not for the cooperative-first group (r = .29, p .10). Among the specific response categories EO-P was significantly related only to the frequency of offers in the cooperative-first group (r = .63, p .01) when the correlation between the appropriate behavior category and the total number of task-relevant acts was eliminated statistically. No relationship was found between the EO-P scores of the two members of the dyads (r = .13, p .10).

Time Scores

The time required by the Ss to complete their puzzles was also subjected to an analysis of variance. The results of this analysis, reported in Tables 5 and 6, indicate an effect of payoff condition at the .01 level, as well as interactions between order and payoff (p .10) and between sex, order, and payoff (p .05). Subjects took longer, i.e., were slower, in the cooperative condition than in the competitive condition, especially when the competitive condition was first. Within the competitive-first group, girls were particularly slow in completing their puzzles under cooperative payoff. It should be noted that the times required by the two members of the dyads to complete their puzzles were significantly correlated (r = .56, p .01), especially in the competitive condition (r = .88).

Puzzle-making performance

In a post hoc analysis of performance, Ss were classified into successful and unsuccessful types. Those Ss who won 75% or more of the competitive trials were considered successful; their partners were designated unsuccessful. Ten of the 19 dyads were included in this analysis. HC Ss were disproportionately represented in the successful group and LC Ss in the unsuccessful group. Although tests of significance were not performed on these groups, the means reported in Table 7 reveal some noteworthy trends. It is clear that in the HC group success was associated with speed. The successful HC Ss were over twice as fast as the unsuccessful HC Ss while successful LC Ss were actually slightly slower than were unsuccessful LC Ss. The major category of responses associated with HC success was the percentage of taking, while offering also showed some advantage. Complying, and, to a lesser extend, demanding, worked against the success of HC Ss.

Table 7 about here

Within the LC group, the total frequency of task-relevant acts was most strongly associated with success, with successful *S*s emitting four times as many acts as unsuccessful ones. The percentages of demands and offers were somewhat higher among the successful than the unsuccessful LC *S*s.

The comparisons of successful and unsuccessful *S*s were closely matched by a comparison of trials won versus trials lost in the entire MC and LC samples (see Table 8), as would be expected from the fact that most trials were won by successful *S*s. MC *S*s won 114 trials, while LC *S*s won 61. Losses among the LC *S*s were associated with few acts per trial and a low percentage of demanding. A high frequency of losses and a low frequency of task-relevant behavior were particularly common among *S*s in MS-2.

Table 8 about here

Discussion

The experimental setting was designed to encourage social interaction without restricting its content. Despite this encouragement, task-relevant social behavior was minimal. The vast majority of behaviors emitted by *S*s in both socioeconomic samples was concerned directly with the physical manipulation of puzzle pieces. Smiles, nods, pleases, thank yous, and other "polite" responses common to adults were conspicuously absent. The only frequently occurring response which apparently was intended to influence the behavior of the other *S* was the *demand* (about 23% of total acts). However, demands were often not complied with (especially by LC *S*s), and *S*s emitted proportionately fewer of them in the second half of the session.

Although the offer did not contribute to the payoff of the S making it in the competitive condition, the fact that the proportion of offers was not sensitive to the payoff condition variable argues that Ss were not using it as an attempt to influence their partners. Whether this lack of responding to the social aspects of a task situation reflects a general absence in preschool children of behaviors intended to influence others or a specific adaptation to a situation which did not demand the use of influence techniques remains to be determined.

The significant results of this experiment often tended to be found in the interaction of two or three of the variables. This fact suggests that, rather than general gross differences between middle and lower class children, investigators may expect to find differences in subgroups of these populations (e.g. age or sex) under certain conditions. The extreme range of individual differences found within both groups, as well as the general lack of differences in their social behavior suggest that the labels "middle class" and "lower class" are by themselves too gross to be of much value in predicting a child's social behavior under all circumstances.

The greater success of the MC Ss can probably be attributed to their superior ability to perform the task, rather than to any superior influence ability. MC Ss engaged in proportionately more of the most effective responses (taking and offering) and tended to be more efficient (though neither total acts nor task time showed significant main effects of social class).

The findings suggest, however, that the most effective strategy differs for the two subject populations. MC winners tended to take more and demand less than did MC losers, while the opposite was true of LC Ss. Demanding was probably a more effective strategy for LC than MC Ss, as MC Ss complied more often to demands than did LC Ss.

While the correlation between partners in the rate of performing given responses appeared to be only slight, there was a significant correlation between partners in task time. This might be due to competition, to imitation, or to the contribution of one S's responses to the completion of the other S's puzzle. Clearly, competition led to more rapid performance in both social groups than did cooperation. An unexpected finding, however, was that the first payoff condition set the pace for performance under the second payoff condition; when the competitive condition was first, Ss responded at higher rates to both payoff conditions than when the cooperative condition was first. Most surprising was the finding that the acceleration of responses by initial competitive conditions was stronger among LC girls than any other group. An interpretation is suggested later in this discussion.

The response category (proportion score) that was increased most by initial competition was demanding, while taking was greater when cooperation was first. The latter effect also was true of offering, particularly among MC girls. accommodating behavior has been found to be characteristic of middle class women in other contexts (Vinacke and Gullickson, 1964; Rosenfeld, 1966).

Visual orientation toward the partner, like demanding and like overall responsiveness, was greater when the first task was competitive than when cooperative. Also, MC Ss reduced their amount of looking at their partners during the second payoff condition, regardless of its payoff, while LC Ss maintained their initial levels. In a previous study, Head Start and MC preschool children were compared for visual orientation while each was interacting with a middle class teacher (Horowitz and Rosenfeld, 1966) In that study the Head Start children engaged in more nonadaptive looking than did the middle class children; that is, they looked more at the teacher and less at their task materials. In the initially competitive situation of the present study, LC *S*s persisted more in looking at their partners than did MC *S*s. This looking was not related to performance. However, it may have reflected greater concern with cues to interpersonal affect among the LC than MC *S*s. Facial cues have been shown to be particularly good sources for inferring social feelings (Ekman, 1966; Rosenfeld, 1966).

Of course, other explanations could account for the more rapid decrease in looking at the partner by MC than LC *S*s. These include more rapid satiation of task interest by the MC group, and greater unfamiliarity with the middle class testing situation among the LC group.

The general tendency of LC girls to be more generally active in the competitive atmosphere (competition-first condition) is worthy of some speculation. Perhaps the LC girls were imitating the behavior of adult females in their home environments. Maternal dominance, due to male absenteeism and other reasons, is particularly likely in lower-class Negro families. Thus, the LC girl may view the competi payoff task condition as the appropriate place to demonstrate successful dominant behavior.

Followup Study

Following completion of the main experiment, two pairs of *S*s were selected for further study in the hope of determining some of the conditions under which unsuccessful LC *S*s would be more effective. Pairs were chosen in which the LC *S*s were among the least successful performers, had exhibited extremely low and relatively stable rates of task-relevant behavior, and had been paired with MC partners whose rates of behaving were relatively stable and typical of the MC group. One of the *S*s, here labeled LC-1, was a male Negro of age 4 years, 9 months at the beginning of the study. The other (LC-2) was a male Caucasian of age 4 years, 5 months.

These two *S*s were brought a second time to the laboratory with their original MC partners, and were given the same tasks that they had performed approximately three weeks earlier in the main experiment. The payoff conditions were given in the same order as in the first session (competitive-first for LC-1, and cooperative-first for LC-2). Approximately one week later, LC-1 and LC-2 were paired together at their own nursery school. The cooperative condition was given first at this session. About one week after this pairing, LC-1 and LC-2 were again paired with their original MC partners at the laboratory, where they received the payoff conditions in their original orders.

The pairing of the two LC *S*s together was an attempt to provide what was thought to be an optimal environment for their performance. On the assumption that any combination of an unfamiliar environment, an unfamiliar partner, a MC partner, and a successful partner might be detrimental to the responsiveness of the LC *S*s, all of these factors were minimized. The LC *S*s were tested in a familiar environment, with a familiar LC partner of apparently equally poor playing ability. In this setting, the LC *S*s were expected to be most socially responsive and to perform at the upper limit of their ability.

Figure 1 about here

The results of all four sessions in terms of the total number of acts emitted by LC-1 and LC-2 are presented in Figure 1. It can be seen that both LC Ss exhibited a relatively stable, although slightly rising, rate of behavior across the two baseline sessions (Sessions 1 and 2). Their MC partners' baselines also were relatively stable. When paired with each other in Session 3, the LC Ss showed marked increases in behavioral output. In the fourth session, paired again with their original MC partners, the LC Ss returned toward their baseline rates. Across the four sessions, LC-1 emitted 2, 3, 44, and 0 responses, respectively; while LC-2 emitted 0, 5, 23,and 13 responses.

Subject LC-1 won all six of his competitive trials against LC-2. His task times averaged 28 seconds, compared to 39 seconds in the baseline sessions. Thus while his task-relevant behavior increased 1500 percent over baseline, his performance time still improved. This improvement carried over to the final session with his MC partner, even though LC-1 performed no interpersonal responses. The average competitive performance of LC-2 was slower when paired with LC-1 (34 seconds) than when paired with his MC partners (27 seconds), but his responsiveness was greater.

It is clear in each of these two case studies that the LC Ss were not incapable of performing task-relevant behavior. The degree to which they engaged in such behavior was found to be a function of their "environments". In the "lower class environment" they were highly active; in the "middle class environment" they were extremely nonresponsive. To the degree that the two LC Ss are representative of lower class children, it may be inferred that the performance capacities of lower class children are vastly underestimated in middle class situations. The inhibiting effects of the middle class environment appear to be beyond the "culture-shock" of initial encounters that was observed in previous studies (Horowitz & Rosenfeld, 1966).

The lower class environment in the current followup study included a wide variety of variables that were likely to facilitate responsiveness. The results indicated that environment does greatly affect task-relevant behavior. The study was not designed, however, to determine which differences between the LC and MC environments were responsible for the observed differences in responsiveness. Adaptation to the task and to the research personnel could be ruled out as critical differences since these were constant across all repeated sessions, and stability of baseline behavior was demonstrated. Among the possible variables facilitating behavior in the LC situation were familiarity with the physical environment, familiarity with the peer, physical features of the peer, task relevant behavior of the peer, and task-irrelevant behavior of the peer. These alternatives should be tested by experiments in which each potential casual factor is independently varied. On the basis of the current results, the method of varying treatments across single subjects would appear to be a highly sensitive procedure for testing further hypotheses.

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Footnotes

[1] The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D. C. 20506. The opinions expressed herein are those of the authors and should not be construed as representing the opinions or policy of any agency of the United States Government

[2] The authors appreciate the assistance and cooperation of Mrs. Ann M. Kugler, Miss Barbara Guylevics, Miss Linda Krutch and the pupils and staff of the nursery schools that participated in the study.

Table 1

Sex, Ethnic Group Membership, and Age of *S*s in Each

Nursery School Sample

Nursery School	Sex		Ethnic group		Mean age	Age range
	# Males	# Females	# Caucasian	# Negro	(years-months)	(years-months)
MC	10	9	18	1	4-9	4-3 to 5-3
HS-1	5	5	6	4	4-9	3-9 to 5-2
HS-2	5	4	5	4	4-11	4-3 to 5-11

Table 2

Frequencies and Percentages of Dominant Responses in Lower and Middle Class Groups

(N=19 each)

	Middle Class		Lower Class	
	f	%	f	%
Demand				
Verbal	97	(19)	69	(17)
Nonverbal	20	(4)	23	(6)
Take	155	(31)	104	(26)
Comply	52	(10)	45	(11)
Offer	150	(30)	124	(30)
Other (Misc.)	30	(6)	42	(10)
Total	504	(100)	407	(100)

Table 3

Mean Task-Relevant Acts Per Social Class Payoff Condition, and Order of Conditions

Payoff	Male		Female		Male		Female	
	Coop. 1st	Comp. 1st.	Coop. 1st.	Comp. 1st.	Coop. 1st	Comp. 1st	Coop. 1st	Comp. 1st
	Total Acts							
Coop.	10.4	12.2	14.8	13.8	12.6	6.2	8.6	19.3
Comp.	7.2	16.6	11.8	16.3	8.6	9.0	8.6	18.8
	Arcsin % Demands							
Coop.	0.57	0.67	0.76	1.57	0.62	1.02	0.45	1.33
Comp.	0.38	1.07	0.36	1.48	0.43	1.54	0.58	1.48
	Arcsin % Takes							
Coop.	1.66	1.21	1.22	0.35	0.95	0.63	0.66	0.67
Comp.	1.18	1.05	1.55	0.46	0.65	0.75	0.75	0.24
	Arcsin % Offers							
Coop.	0.94	1.34	1.32	0.60	0.84	0.82	0.73	0.71
Comp.	0.96	1.08	1.29	0.66	0.86	0.35	0.77	0.93

TABLE 6

Summary of Analysis of Variance of Task-Relevant Acts

Source	d.f.	F - ratio total acts	Arcsin % Demands	Arcsin % Takes	Arcsin % Offers
	1				
Social Class (A)	1	1.07	<1	4.37**	2.87*
Sex (B)	1	3.76*	<1	1.26	<1
Condition Order(C)	1	4.03*	13.03***	3.18*	<1
AxB	1	<1	<1	<1	<1
AxC	1	<1	<1	<1	<1
BxC	1	2.39	1.31	1.16	<1
AxBxC	1	6.63**	<1	<1	3.10*
Error (between)	30				
[illegible]	1				
Payoff Condition(D)	1	<1	<1	1.06	<1
AxD	1	<1	1.99	<1	0
BxD	1	<1	1.93	3.39*	1.33
CxD	1	2.42	9.06***	<1	<1
AxBxD	1	<1	1.10	1.45	<1
AxCxD	1	<1	<1	3.48*	<1
BxCxD	1	<1	2.02	3.06*	1.73
AxBxCxD	1	<1	<1	1.89	<1
Error (within)	30				

*p $\leq$ .10
**p $\leq$ .05
***p $\leq$ .01

Table 3

Mean Task Time and Looking at Partner Per Social Class, Payoff Condition, and Order of Conditions

	MIDDLE CLASS				LOWER CLASS			
Payoff	Male		Female		Male		Female	
	Coop. 1st.	Comp. 1st.	Coop. 1st.	Comp. 1st.	Coop. 1st.	Comp. 1st.	Coop. 1st.	Comp. 1st.
	Looking at Partner							
Coop.	0.78	0.93	1.23	0.71	1.01	1.02	0.69	1.26
Comp.	0.62	1.33	0.80	1.33	0.33	1.16	0.88	1.41
	Task Time (Min.)							
Coop.	3.16	3.36	2.68	3.43	4.36	4.48	3.46	3.86
Comp.	2.27	2.31	2.31	2.83	2.41	3.03	2.68	2.41

Table 6

Summary of Analysis of Variance of Task Time and of Looking at Partner

Source	d.f.	F-ratio	
		Looking at Partner	Task Time
Between Ss	[illegible]		
Social Class (A)	1	<1	1.70
Sex (B)	1	<1	<1
Condition Order (C)	1	8.32***	2.80
AxB	1	<1	<1
AxC	1	1.40	<1
BxC	1	1.23	1.40
AxBxC	1	2.86	<1
Error (between)	30		
Within Ss	[illegible]		
Payoff Condition (D)	1	<1	37.31
AxD	1	<1	<1
BxD	1	<1	<1
CxD	1	8.71***	3.37*
AxBxD	1	1.37	<1
AxCxD	1	3.87*	<1
BxCxD	1	<1	6.72**
AxBxCxD	1	2.86	<1
Error (within)	30		

*p .10
**p .05
***p .01

TABLE 7

Mean Responses of "Winners" and "Losers"*

Responses	MIDDLE CLASS		LOWER CLASS	
	Winners (N=4)	Losers (N=5)	Winners (N=5)	Losers (N=4)
Task Time (mins.)	18.7	20.7	20.3	20.8
Total Acts	28	20	48	18
% Demand	18	28	48	38
% Take	48	20	26	28
% Comply	3	16	13	15
% Other	30	20	30	20
Looking at Partner	26	19	28	21

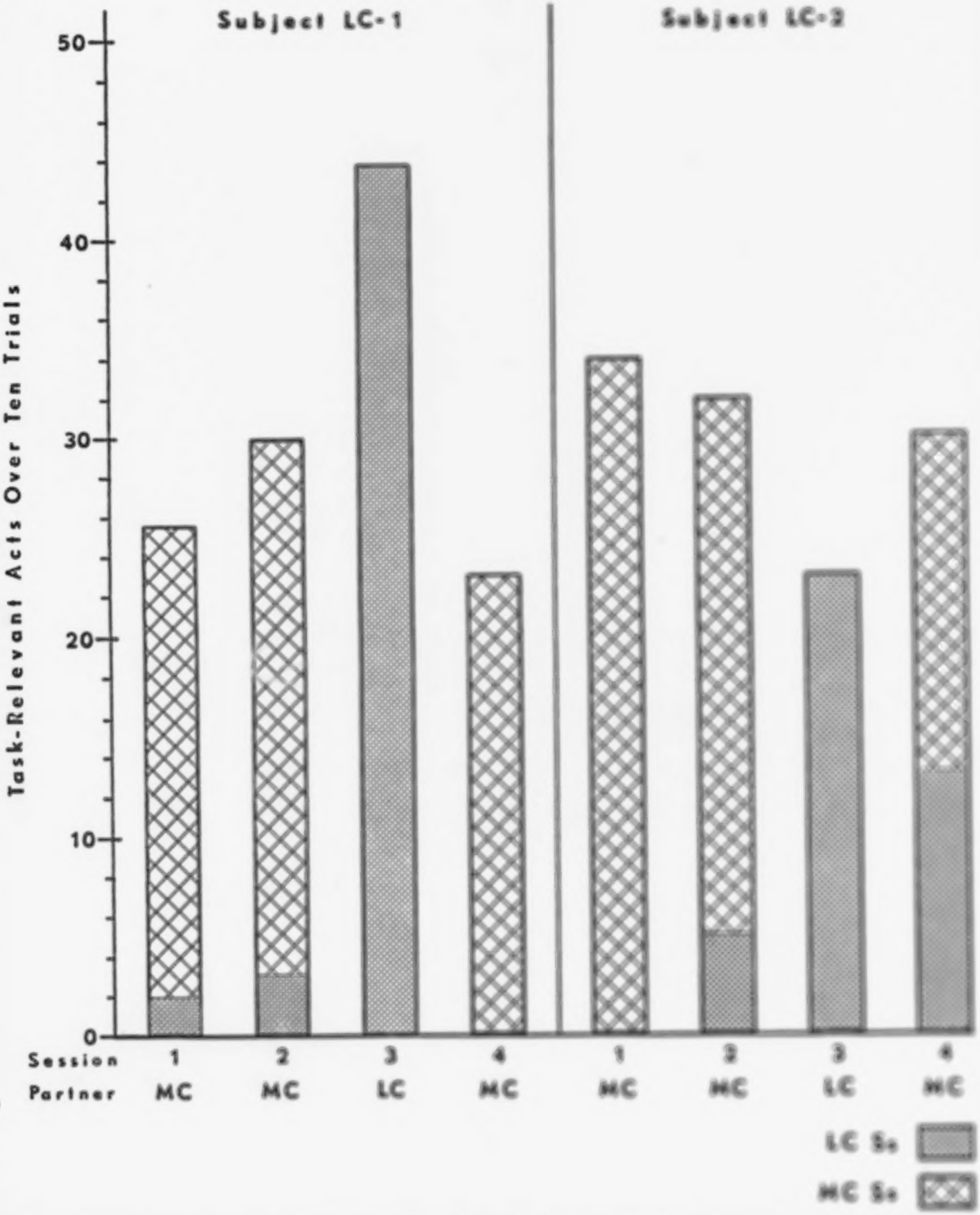
* on more than 75% of competitive trials.

TABLE 9

Mean Responses in Winning and Losing Trials

Responses	MIDDLE CLASS (N=15)		LOWER CLASS (N=15)	
	Winning Trials (N=116)	Losing Trials (N=61)	Winning Trials (N=61)	Losing Trials (N=116)
Acts/Trial	2.00	2.11	2.36	1.89
% Demand	33	33	41	31
% Take	30	33	23	25
% Comply	9	16	10	9
% Other	30	25	26	34

Task-Relevant Acts of Two Lower Class (LC) Ss
Paired with Middle Class (MC) Ss and with Each Other



The University of Kansas Head Start Evaluation and Research Center

VI.

A Failure to Show an Involvement of Current Motivational Variables in the Response of Head Start Children to the Assessment of Intelligence by Means of the Stanford Binet Test

("The Reinforcement of Intelligence
in Culturally Deprived Populations.")

Donald M. Baer, Ph.D.

Department of Human Development

A Failure to Show an Involvement of Current Motivational Variables in the Responses of Head Start Children to the Assessment of Intelligence by Means of the Stanford-Binet Test[1]

Donald M. Baer, Ph.D.

The project was intended to show whether performance on the Stanford-Binet test of I.Q. could be increased by reinforcing responses to the test items, correct or incorrect, with a tangible, edible, and more-than-social reinforcers, specifically, M&M candies. Head Start children were chosen as subjects, since (1) they are currently the target of an intensive program to improve their capabilities for dealing with American public schooling, (2) they typically do less well on the Stanford-Binet test than do children of middle or upper class origins, and (3) the Stanford-Binet is the prime criterion for evaluating the effectiveness of Head Start programs in accomplishing their goals.

Consequently, two testers gave Stanford-Binet tests in the standard manner to a randomly selected half of a sample of Head Start children; to the other half they administered the test as usual, except that they offered the child an occasional candy for responding. Half a year later, the children were re-tested in similar ways. Each of the two testers made approximately half of his tests in the standard way, and half with candy reinforcement.

All groups of children showed an approximate I.Q. of 90 as a result of the first testing; all groups showed an approximate I.Q. of 93 as a result of the second testing. Differences between the groups were negligible in amount and statistically insignificant. Thus, it appears that I.Q. derived from the Stanford-Binet test is insensitive to potentially reinforcing contingencies between any reasonable response to the test and candy. To that extent (which is a slight one), it is not suggested that the I.Q. testifies more to a lack of motivation to answer, perhaps, characteristic of Head Start children being tested by the typically white and middle-class tester, than to a lack of the responses tapped by the items of test.

FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.

The University of Kansas Head Start Research and Evaluation Center

VII. a.

"A Case Study in Establishing a Differentiated Speech Response Through Generalization Procedures"

Joan M. Jacobson, B.A.

Barbara C. Etzel, Ph.D.

Department of Human Development

A Case Study in Establishing a Differentiated Speech Response Through Generalization Procedures[1]

Joan M. Jacobson and Barbara C. Etzel
The University of Kansas

ABSTRACT

Running head: Establishing differentiated speech through generalization.

A technique for measuring generalization effects of speech training is described. This procedure requires a baseline measure followed by training-probe, training-probe, etc., sequence. The necessity for recording data during both speech training and test conditions in order to prescribe the next procedure for subjects was emphasized. Several procedures for measuring generalization were reviewed.

Submitted: November, 1967

A Case Study in Establishing a Differentiated Speech Response Through Generalization Procedures[1]

Joan M. Jacobson and Barbara C. Etzel
The University of Kansas

That verbal behavior can be most successfully analyzed and modified under the procedures of an experimental analysis of behavior seems to be more of an established fact than an issue. The past twelve years have especially yielded evidence to support this conclusion. Such areas as: topography of vocal responses; verbal chaining; effects of punishment and deprivation; rate manipulation; stuttering; echolalia; mutism; and conditioning of infrahuman vocalizations have all been studied from an experimental analysis paradigm. (For a recent review of verbal behavior studies from an experimental analysis point of view, see Holz and Azrin, 1966.)

Studies that have shown the widest variety of verbal behavior modification procedures with children have been with austistic subjects. (i.e., Lovaas, 1966; Risley, 1966; Risley and Wolf, 1968.) All of these studies have used shaping, imitation training, fading in of new stimuli, fading out of prompts, punishment and time out from reinforcement, chaining, and differential reinforcement of other appropriate behavior incompatible with inappropriate behavior. Many of these procedures are used when the child has a "parroting" response called echolalia. When this is the case, the training is built on already acquired verbal responses. Generally the main area of concentration is on bringing these verbal responses under stimulus control.

Many of the same procedures are also used with non-echolalic, speech deficient children with the emphasis on shaping differentiated response patterns, e.g., pronouncing initial or final sounds such as "th", "v", "f", or "s". Many times this process of shaping is long and tedious with neither the therapist nor child noting possible progress beyond the actual word being shaped. Such can occur even when the therapy procedures include reinforcement. As Risley and Wolf (1968) point out therapeutic procedures on a day-to-day basis may not reveal a clearly progressing ordiliness due to daily response fluctuations. However, gradual changes can be discerned when records are kept.

The following case study describes a procedure for training the final "t" sound and a method of measuring generalization to other words which also end in the final "t". By reporting this latter method, we also are stressing the necessity of gathering data during therapy. Although many therapists often hope or assume generalization will occur, it is better if a record can be produced to see if in fact it does. Further information of this type would often help decide future speech modification procedures for a child, depending on whether generalization was occuring.

Generalization as used in this study, refers to emitting one particular sound within a variety of words subsequent to training this sound within only one word. Prior to training, the sound which was shaped had been present at a very low rate. The procedure for measuring this generalization was through the use of probes.[2] For example, the baseline rate of emitting final "t" sound on words was first determined from the S's ability to imitate a list of words ending in final "t", when emitted by E. Speech modification proceeded using only one training word. During the course of training the original list of words was administered as a probe and the rate of generalization was measured by the increases of final "t" sounds when imitating these non-trained words.

METHOD

Subject

S was a 2 year-8 months old male child who was attending the University of Kansas Infant Study Laboratory. During the five-month period of this study, *S* was also a subject in another research project which involved shaping gross motor responses. A history of medical diagnoses and consultations indicated *S* exhibited slow motor development due to congenital brain damage and had not learned to walk prior to the study. His vocalizations were inarticulate and of low volume.

General Procedures

The experimental procedures were divided into four phases: 1) Establishment of instructional control; 2) Assessment of language responses; 3) Probe test baseline; 4) Auditory stimulus-vocal response training sessions with interspersed generalization probes; and 5) Visual stimuli - vocal response generalization probes with a training session interspersed.

It was necessary to establish instructional control even prior to assessing this *S*'s language problems because it was found that his attending behavior was not well established and his responses to instructions rather delayed. It was felt that part of the reason for this lack of instructional control was due to few contingencies placed on him in the past.

Through casual observations of the *S*'s vocal behavior prior to the study it was known that he was emitting several misarticulations in addition to speaking at a low volume when compared with others of his age. Because we felt it better to attempt to modify only one component of his speech pattern at a time and because we hoped to demonstrate that this one vocalization, subsequent to training, would generalize over many words, it was necessary to carry out an extensive language assessment so as to pinpoint the specific articulation errors he emitted and to choose one from these to modify.

In the auditory stimulus - vocal response condition, one cannot disassociate the training sessions from the probe sessions because of their interdependent nature. Data recorded during training sessions determined when probe sessions were instituted and data from the probe sessions, in addition to the prior training sessions, directed the choice of procedures for the next training session. Such information would not have been available if the data had not been precisely recorded, indicating the approximation value of responses *S* was emitting, as well as unusual pronunciations. Because all sessions, training and probe, were tape-recorded and the data subsequently analyzed from the tapes, it was possible to extract this information.

A further generalization of *S*'s final "t" response was tested through the presentation of pictures whose labels were words with the final "t" sound. The generalization test in this case was to determine if the final "t" sounds emitted by *S* would maintain even though there was no opportunity for him to directly imitate *E*. Such a test was considered to more closely approximate the natural environmental conditions in which S would be required to emit this vocalization.

1. Establishment of Instructional Control

Instructional control of motor behavior was established in six sessions using procedures for establishing modeled-dependent, imitative behavior (Baer, et al., 1967). E said, "Do this", and demonstrated a motor behavior for S to imitate. Small edibles, sips of juice or 15" of play with a small truck were contingent upon S matching E's demonstration. Once instructional control was established for motor behavior, E began presenting words, e.g., "Boy", "dog"), with delivery of reinforcement contingent upon any verbal utterance of S, regardless of pronunciation.

2. Assessment of Language Behavior

E presented words to S which represented most of the phonetic sounds of the English language. The stimuli were single words from a list of phonemes reported by Bixley (1960), plus other words and phrases. Reinforcement was contingent upon S emitting an utterance, regardless of its approximation value. After nine assessment sessions the final "t" sound was chosen for study.

3. Probe Test Baseline

Prior to the auditory stimulus-vocal response imitation training, a baseline of S's final "t" vocalizations to a 20-word probe test was obtained. This 20-word list (all words ended in "t") was used in all subsequent probes and served as a comparison for the various training phases. Its purpose was to assess response improvement through generalization following training on other final "t" words.

4. Auditory Stimulus - Vocal Response Training and Probe Procedures

Training Phase I - This phase was instituted primarily to develop procedures appropriate to this particular S's specific misarticulations and to determine suitable reinforcers for him. Four words, "at", "cat", "hat" and "boat" were selected as training words. In the presentation of the auditory stimulus, E separated the final "t" sound from the remainder of the word. For example, E said "Ca...", S responded "Ca...", reinforcement was delivered, E said "t", S responded "t", and reinforcement was again delivered. If S did not correctly match either the first part of the word or the final "t", E would repeat the sound until an approximation of the correct vocalization was emitted by S.

Probe I - The 20-word test list was presented for a total of 40 trials, thus included two or more presentations of each word. Reinforcement was contingent upon any vocal utterance emitted subsequent to E's presentation of the probe word, regardless of its approximation value. The data resulting from this probe was used to direct the choice of procedures for the next training phase. This method of train-probe, train-probe, etc., allows the therapist to frequently test the fruitfulness of procedures and to make procedural changes that are based upon data and not casual observations of the day.

Training Phase II -- During the eight sessions of this phase only the word "cat" was used as a training word, because it was felt that one word would be a more discriminable training stimulus than four as used during Training Phase I. The vocal presentation of the training word by E was identical to that of Training Phase I. During this phase, however, E elongated the vocalization of "Ca..." to "Caaaaa...." and S emitted his "Ca" during E's presentation, adding the final "t" sound as E added it.

Probe II - During six sessions the 20-word probe list was presented approximately three times each session. This probe was administered across several days to determine the durability of S's final "s" approximation. During the last two days the reinforcement schedule was changed from continuous (CRF) to variable ratio (VR:3). It was necessary to continue to deliver reinforcers to maintain S's responding. However, it was felt that the CRF schedule was possibly producing a satiation condition. The VR:3 reinforcement schedule was predetermined and hence non-contingent upon correct responding.

Training Phase III - Procedures similar to those of Training Phase II were used during this phase with the exception that more stress was placed upon the final "s" sound rather than attempting to join the "base" with the "s". This was done in an attempt to enhance the sounding behavior of S to the final "s" sound. Toward the end of the phase S was also reinforced for close attention to E's face and for responding vocally after "s" to E's hand and subsequent to the presentation of the final "s" sound. Delivery of reinforcement was contingent upon correct responding.

Probe III -- There was only one presentation of the 20-word probe list in one session during this phase because it was noted that S was adding a second vocalization following the "s" sound which approximated "ah". Therefore, a fourth training phase was designed to enable S's vocalization of the final "s" through eliminating the additional vocalization.

4. Training Phase IV -- For one session five words, ending in a final "s", were presented with the word "is" following each of them, e.g., "his is", "does is", "bus is", etc. After approximately three presentations of each of these words in combination with the word "is", the "is" was no longer presented with the words ending in final "s".

Probe IV -- There were four presentations of the 20-word list across two sessions. Reinforcement was again non-contingent on VR:3.

5. Visual Stimulus - Vocal Response Training and Probe Procedures

Probe V -- Prior to the presentation of this probe it was necessary to obtain a set of 10 pictures to which S could respond with the appropriate label and whose labels ended in the final "s" sound. Therefore a preliminary test was administered which consisted of a group of 20 picture cards whose labels ended in "s". From this list a test set of 10 cards was chosen on the basis of S correctly naming each picture on two of three trials without E ever labeling the picture for S. The test set consisted of six cards which had not been previously presented in this study (new words) and four which had (old words).

Each of the ten test cards was presented, during Probe V, until S correctly labeled the picture three times in succession. VR:3 non-contingent reinforcement was delivered during this probe. The time was recorded for the last three response units. At no time during the probe condition did S [illegible] label the picture in the presence of E. An analysis of Probe V indicated that for each of the ten words in the test set S emitted a low percentage of the final "s" vocalization. Consequently a remedial session was instituted to eliminate these errors.

Training Phase V: Those of the words in which S emitted a low percentage of final "t" articulations in Probe V were used for this training session. Instructions were given to be sure to say the "t" loudly prior to each of S's pronunciations of a picture card. Simultaneous with the presentation of the card S said the corresponding label. The number of trials on each of the words was dependent upon the S's correct response rate. There was a total of 81 trials during the entire training session. Reinforcement was contingent upon correct responses.

Probe VI: The picture test set was presented four times to S. The experimental conditions were the same as those of Probe V of this phase of the study.

RESULTS

During the establishment of instructional control, S matched 87% of the active stimuli and 95% of the vocal stimuli. These averages are representative across the six days.

The assessment of speech revealed difficulty in pronunciation of initial "s," "l," "sh" and "r" sounds along with final consonants such as "s," "z," "t" and "d". The final "t" was a more discriminable response for recording purposes. It was judged easier for initial speech training than other sounds, and finally it was a sound already in his repertoire. Because "t" and "d" were not emitted very frequently-- if at all. Seventy-three words were presented to S during assessment. Each word was presented several times and in different orders.

In Figure 1 the far left column indicates that during baseline the final "t" was emitted by S 13% of the time. This baseline measure was obtained from the 31-word probe test set.

Insert Figure 1 about here

This figure represents the baseline level with which further training can be compared.

Following training of the final "t" articulation for the training words "cat," "hat," "bat," and "boat," Probe I was administered. The results of Probe I are graphed in the second column of Figure 1. The final "t" articulation was emitted 17% of the time, representing an increase from the results of the baseline measure. However S was still emitting the final "t" in less than 20% of the test words.

Following training Phase II using the word "cat" as a training word, a series of six tests were given for Probe II. These series of six tests (over as many days) were administered to assess the stability of the final "t" articulation. No training sessions were interspersed between probe sessions. The percentage of correct responses for each of these tests are labeled under "A" through "F", Probe II. The effects of training with the word "cat" appear to have increased the emission of the final "t" on other words. The percentages of S's correct responding increased from the prior 47% to 91, 97, 78, 78, 66 and 80 percent across the six probe days. However, it also appears that the emission of the final "t" was not very stable across time. The range of tests extended from 66 to 97 percent correct responding and there was some indication of a steady decrease. Although in the last session of Probe II S emitted 80% correct final "t" vocalizations on the test word list, it was felt that further training should occur prior to testing generalization on visually presented stimuli.

The training sessions between Probe II and Probe III indicated a regression in S's behavior. A detailed analysis of S's behavior during these training days showed that he was responding with the final "t" sound when it was presented alone, i.e., as opposed to presenting the total word stimulus or "ca.." preceding it, approximately 90 to 99% of the time. However when "ca.." preceded the "t", the percent correct responding ranged from 0% to 36% across the 8 training days. This failure to add the final "t" to the "ca.." vocalization seemed to influence the experimenter. It is noted that out of the total stimuli presented to S in any one session the percentage of time which final "t" was presented alone in each session increased across sessions: 40%, 49%, 54%, 63%, 78%, 81%, 67%, and 75%.

Training was then stopped and Probe III was administered. The results of Probe III are depicted in Figure 1(column four). The percentage of correct final "t" vocalizations when emitting the total words on the test was 58%. This low score reflects not only the failure to emit the "t" at the end of the words but also his emitting an additional vocalization subsequent to the final "t" which approximated "ə". This addition was counted as incorrect and thus lowering the Probe III percent correct responses.

A one day training procedure was carried out to eliminate the ə sound. This training was apparently effective. Probe IV resulted in 89% correct emissions of final "t". Also none of the responses on Probe IV were followed by the "ə" sound. Whereas half the words in Probe III were emitted with the additional vocalization.

It appears that training primarily on one word can result in generalization to similar elements in other words. It is also possible to say, that S was learning to engage in matched-dependent vocal behavior. One might question at this point whether or not S would add the final "t" to words when he did not have the vocal model immediately preceeding his response. Consequently it was decided to present a visual stimulus rather than the auditory stimulus of E's pronunciation, to assess whether or not S would pronounce the final "t" without hearing E's stimulus word.

Figure 1 (Probe V) presents S's percent of correct final "t" vocalizations within words emitted in response to visually presented pictures. The total percent correct for all 10 words, presented three times, was 74%. Of the 10 words probed, four had been considered "old"(probed earlier) and six were "new" (never presented in the study before). S vocalized a final "t" on the "old" words 86% of the time and 67% of the time on the "new" words. Therefore it appears S was not dependent upon an immediately preceding model for the pronunciation of a final "t".

Since there was a difference in the final "t" productions of S between "old" and "new" words emitted to visual stimuli, three of the "vase" were used as training words for a final training session using both visual and auditory presentations of the picture stimuli. Figure 1, Probe VI, shows final "/z/" productions of 90% for all 10 words presented visually. For the "vile" words final "/z/" was emitted for 80% of the trials and for the "vase" words 90%. The training procedures on 5 of the new words appears to have been effective in increasing th final "/z/" responses from 60 to 90%.

Discussion

This study consists of a case report of speech training for a young preschool child. The design and the evaluation procedures are suggested as necessary for documenting progress in speech training. Because the process of shaping differentiated vocal responses is often a long process, any procedure which can reduce this process for the therapist and subject is important. Generalization is often desired by behavior modifiers because it is a "time saving" result, i.e., the more generalization occurs within limits, the fewer responses must be shaped. However, unless procedures are used for assessing generalization, then unnecessary training may be continued. It is also necessary to know if generalization does occur following training. If it does not, the training sessions are [illegible] unless training for generalization follows.

The data show a fairly orderly and rather immediate increase in this girl's final "s" response to non-trained test words. By the beginning of Probe IV, it appears the training procedures with "cat" were effective in generalizing to other words ending in the final "s".

However, as is often the case in many therapeutic disciplines the subject does not always maintain the progress he has previously demonstrated. The fairly steady increase in responses across Probe II remains can only be speculated upon since no definitive manipulations were used to analyze the decrease. Such analysis was not possible since the reason for the prolonged probe was to test the durability of the response over time without intervening training. The speculations which appear most plausible, for the decline in final "s" responses to non-trained words, include a loss of reinforcer control due perhaps to satiation or the delivery of reinforcers for not adding the final "s" as well as adding it correctly, thus increasing the probability that the final "s" would not be emitted on new repetitions of paragraphs. Support for the above can come in the subsequent training sessions when S was not adding the final "s" to the training word as frequently as he had previously.

A recent study by [illegible], [illegible], and [illegible] (1967) indicates that manipulation of the difficulty of stimuli in verbal training sessions can control a subjects disruptive behavior. That is, if disruptive behavior is followed by difficult stimuli, disruptive behavior decreases and vice versa. This study also suggests that it is possible for a subject to control the presentation of stimuli by E. When S was not responding with the final "s" during Training Phase III, E increased the frequency of simple "s" stimulus presentations in relation to presenting the total words (cat) with the final "s" ending. It is possible that S was able to control the experimental sessions at this time by not responding successfully and hence being presented with the simpler stimulus.

It is possible that the concentrated work on "s" during Training Phase III resulted in the additional [illegible] response at the end of the word during Probe IV. The procedure of adding "ed" to the words that ended in "s" during the fourth training session reflects a technique used by behavior modifiers for getting rid of unwanted behavior, in this instance an incompatible response (the emission of "ed") was reinforced in place of [illegible]. Once the incompatible response was established, the undesired response was discontinued and just the desired word with the final "s" occurred correctly.

The use of visual stimuli at the end of the study was an attempt to measure the durability of the response in conditions even further removed from the training procedures than Probes 1-23. That is, the "fragility" of the response was further tested under other generalization conditions. It is possible that adding the final "s" to non-trained words was mainly under control of the experimental procedures. The use of visually presented stimuli more closely approaches what might be the situation in "every day" conversation. When it is impossible to take data on a subject's natural language behavior, then a procedure similar to the above would seem advisable to test generalization within stimulus conditions further along the generalization continuum of similarity to the original training procedures. Of course the most desirable final procedure would be to obtain generalization samples within the subject's natural environment.

FOOTNOTES

1. The research reported herein was partially supported through a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the authors and should not be construed as representing the opinions or policy of any agency of the United States Government.

2. The authors are indebted to Dr. James Sherman for his contribution to the original idea upon which the design was made and for his continued consultation on procedures.

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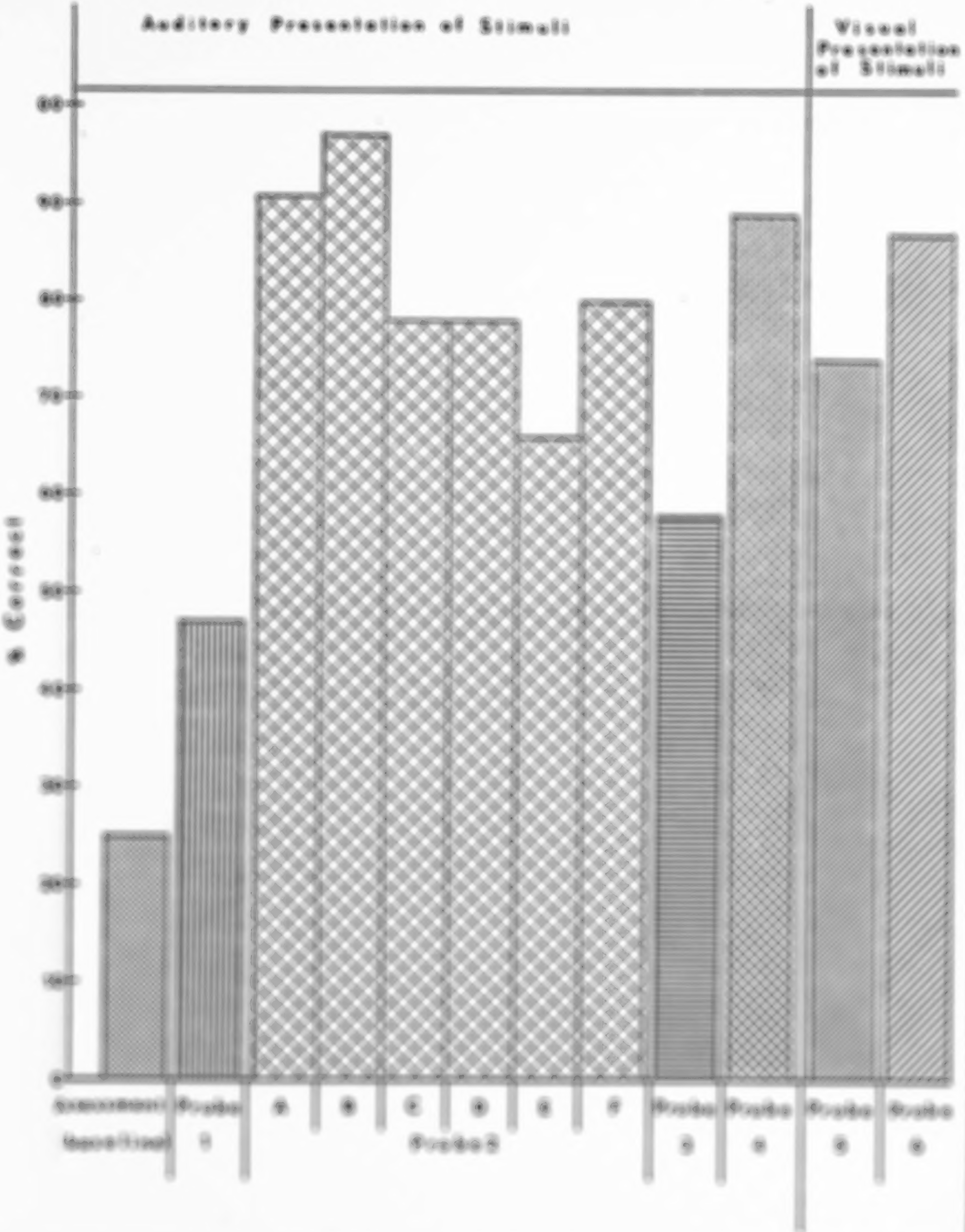
Fig. 1 Percentages of Correct Final "l" Responses During Probe Conditions



The University of Kansas Head Start Research and Evaluation Center

VII, B.

"Establishment of Nonverbal Color Discrimination Responses to Auditory Color-Labelling Stimuli and Subsequent Effects on Color-Labelling Responses"

Patricia A. [illegible], B.A.

Mary Lee [illegible], B.A.

Barbara C. Etzel, Ph.D.

Department of Human Development

ESTABLISHMENT OF NONVERBAL COLOR DISCRIMINATION RESPONSES TO ARBITRARY COLOR-LABELING STIMULI AND SUBSEQUENT EFFECTS ON COLOR-LABELING RESPONSES[1]

Patricia A. Nickel, Mary Lou Michaelis[2] and Barbara C. Etzel
The University of Kansas

Running head: Programming Color Discriminations

A color program was designed to establish a nonverbal (pointing) response to visual and auditory stimuli associated with eight colors. Nonverbal pre- and posttests were administered to preschool children to select Ss who demonstrated few or none of the skills the program was designed to teach. These tests also provided information regarding the efficiency of the program for teaching these skills. A verbal color-naming pre- and posttest was also administered to determine if, through pairing auditory color-labeling stimuli with the visual stimuli during discrimination training, there was any effect on the Ss' verbal color-labeling responses even though these responses were neither required nor reinforced during the program sessions.

Submitted: November, 1967

ESTABLISHMENT OF NONVERBAL COLOR DISCRIMINATION RESPONSES TO ARBITRARY COLOR-LABELING STIMULI AND SUBSEQUENT EFFECTS ON COLOR-LABELING RESPONSES[1]

Patricia A. Riedel, Mary Lou Michaelis[2] and Barbara C. Etzel
The University of Kansas

It is apparent that many discriminations of preschool children are often initially made on the basis of color. Most children attending preschool acquire color discriminations and color-naming responses, probably through the manipulation of materials and through peer and teacher verbal color-naming interactions. However, it is not uncommon to find several children from any preschool group who lack some color discriminations and/or color-labeling behavior. The experience has been that traditional methods, even though concentrated and presented in a one-to-one situation, result in slow gradual acquisition of colors (and [illegible]) for these children. The adults often resort to attributing this to a suspected color-blindness problem.

The color program reported in this study was designed for those children who have not acquired color discriminations through the "usual" (but not clearly understood) procedures. It required nonverbal pointing responses by the S subsequent to the presentation of an auditory stimulus simultaneously with a visual stimulus complex. Following acquisition of the color discrimination, as evidenced by the correct pointing response, a test of the S's performance on verbal color-naming was made. These responses were neither required nor reinforced at any time during the program sessions. Therefore, this investigated upon the effects of the presentation of auditory color-naming stimuli to S simultaneous with the visual stimuli upon the subsequent color-naming behavior of S when only a pointing response was required during the program. Within the technology of programming it is often stressed that only one response should be emitted at a time. To be consistent with this suggestion when teaching color discrimination and naming, one would first establish a simple (through required) pointing response to a specific color and then separately program color-naming responses. It is apparent, however, that the color name (as an auditory stimulus presented orally to S during color discrimination training) is, in addition to the visual color stimulus, becomes a discriminative stimulus signalling the occurrence of reinforcement if responded to correctly. Further, if any, [illegible] responses occur in a well designed program, reinforcement occurs on practically every trial. In the present study, one response results in reinforcement, but two discriminative stimuli are being presented (one visual, one auditory). The fact that a color name is a discriminative stimulus for a child does not guarantee that it will become a part of that child's vocal response repertoire. However, it would be reasonable, within the framework of reinforcement to assume that a child who has had a long history of reinforcement for [illegible] imitative behavior would have a high probability of imitating others' vocal utterances which were at the same time in discriminative [illegible]. This would not necessarily be predicted for those children with speech deficits or who lack such a history of reinforcement such as children belonging to a subcultural group.

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was pretest score fell below 95% (i.e., 95% correct verbal naming responses) even though correct responses on the nonverbal pretest were 100%. The other [illegible] children in the [illegible] group scored above 95% correct responses on the nonverbal and above 95% on the verbal pretests and were thus excluded from the study.

The Color Program

The program was designed to teach eight colors, the four primary colors red, blue, green and yellow in addition to orange, purple, brown and black. Each S proceeded through the entire program of all colors regardless of pretest correct responses on individual colors. This was done because each color was presented with every other color at some time during the program.

The program stimuli were 3" x 5" index cards on which three different colored squares, 1" x 1", of the colored-plastic paper appeared. The program consisted of seven basic sets, each of which was designed to teach one color (with the exception of the first set which taught two colors) while containing all colors presented in previous sets.[2] If an S had difficulty in discriminating between two specific colors, e.g., red and blue, additional sets were designed to teach this specific discrimination. These sets were numbered 8 through 16. All sets were modified for each S's specific problems, i.e., the cards from one set were placed within another set when specific color confusions occurred.

Each of the basic sets of color program cards consisted of three subsets: (1) a review set, (2) introduction of a new color, and (3) presentation of new and review colors under constant stages of fading.[3] The term, fading, in this study refers to the manipulation of the saturation level (i.e., from a light shade of blue to dark blue) of the colors during their presentation in the program.

The following is a detailed description of the above three subset procedures used within a session that taught one of the eight color discriminations.

1. The first subset of program stimulus cards was presented first in each experimental session. This subset consisted of presentations of all review colors (i.e., colors for which S had previously reached a criterion pointing response) as both S+ (correct stimulus) and S- (a distractor or incorrect stimulus). The new color for that basic set appeared from the beginning in this subset but only as S- in various positions and at initially low saturation level which was gradually increased until the saturation level of the new color stimuli approximately matched those of the review colors. E placed the first program stimulus card in front of S and said, "Point to _____." These instructions were gradually diminished to E vocalizing only the color name corresponding to the correct stimulus. The same instructions were presented in all trials unless incorrect responses were emitted, i.e., if S pointed to an S- for a particular trial then E provided a remedial demonstration procedure. For this E pointed to the correct stimulus color patch and said, "This is _____. Point to _____." After each correct response, E placed a green token in the cup (placed on the table before S) and said, "Very good" or some similar social phrase.

2. The second subset of the basic set was presented immediately following the first subset and during the same session so that

subset. At the end of the first subset the new color had not been presented as S+, but had increased in saturation in the S- positions until it approximately matched that of the review colors being presented as S+. The initial cards of the second subset had *only* the new color at full intensity. No review colors, as S-'s, were present. Only the position of the new color changed from trial to trial in these initial cards of this subset. On subsequent cards, the review colors were introduced as S-'s at very low saturation levels. The shades were gradually increased across trials of this subset until the S-'s were approximately equal in saturation level to the S+. The only S+ appearing throughout this subset was the new color and it was constantly at full saturation level across trials. The instructions for the initial cards of this second subset were "This is ________. (*E* points to the new color, the only color appearing on the card) Point to ________." These instructions were gradually diminished to "Point to ______." and to *E* verbalizing only the new color name for that set. Remedial and reinforcement procedures, identical to those in the first subset, were used.

3. The third subset of the basic program stimulus set was presented immediately following the second. Initially, in this subset, only the review colors were presented as S+. Both the new and review colors (when not presented as the S+) appeared as S-. The new color, once again, initially appeared only as a S- on each card. The saturation was increased across trials (more quickly this time) to approximate the saturation levels of the review colors. When the saturation level of the new color was comparable to the review colors, the new color was presented in random order across trials with the review colors as both S+ and S- (depending on whether it was the color to be chosen or the distractor). Therefore, on the final trials of this subset, all colors were at full saturation level and thus the response requirements of these trials matched that of the required terminal performance. Remedial and reinforcement procedures were identical to those in the previous subsets.

Posttest Procedure

Both verbal and nonverbal posttests were administered to the five *Ss* upon their completion of the program. The verbal posttest differed slightly from the verbal pretest in that cards similar to the color-program stimulus cards were used for the posttest rather than the single color cards. Consequently, in both the verbal and nonverbal posttests each color was presented as S+ in the presence of two distractors for three trials. Thus, as in the nonverbal pretest, each color was presented once in the presence of each of the seven other colors for three trials within the total of 24 trials.

RESULTS

Pretest

Figure 1 compares the pretest scores of the five programmed *Ss* with those of the other 12 children attending the nursery school. The left graph represents scores on the nonverbal (pointing response) pretest; the right, the verbal-color-naming pretest results.

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Insert Figure 1 about here

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Each of the Ss' percent correct responses for the total of eight colors are plotted on the ordinate. Subject numbers representing the non-programmed Ss and subject letters representing the programmed Ss are plotted on the abscissa. The "cutoff" point, dividing the percentages of the programmed Ss from those of the non-programmed Ss, is represented by a straight line at the [illegible] point on the nonverbal pretest graph and [illegible] on the verbal pretest graph. There is no overlap in scores between the two groups with the exception of programmed Subject [illegible] who emitted 100% correct responses on the nonverbal pretest, but only [illegible] correct verbal color-naming responses. Even though Subject [illegible] was above the "cutoff" line on the nonverbal pretest, it was decided to administer the program to determine its effects on verbal color-naming behavior.

The mean percent correct nonverbal pretest scores for Ss not in the program was [illegible]. Ss in the program obtained an average of [illegible] correct nonverbal color responses. For non-programmed Ss the pretest mean correct verbal color-naming response was [illegible] and for programmed subjects it was [illegible]. These results indicate two quite different groups of Ss with respect to both their nonverbal (pointing) color responses and their verbal color-naming behavior.

Figure 3 compares the verbal and nonverbal, pre- and posttest percentages for the programmed Ss.

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Insert Figure 3 about here
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The left graph of Figure 3 indicates a significant increase in correct responses between the nonverbal pre- and posttests for four of the programmed Ss. The fifth S, Subject [illegible], maintained the previously obtained pretest score of 100%. All the posttest percentages of the programmed Ss are well above the "cutoff" line and appear quite comparable to the pretest percentages of the [illegible] non-programmed subjects.

The graph on the right side of Figure 3 gives the total percent correct verbal color-naming responses for the programmed Ss on both pre- and posttests. Even though verbal color labels were not directly programmed or required as a response from the Ss the percentages of correct responses for four of the five programmed Ss increased from very low on the pretest to above the "cutoff" line, [illegible] or better, in correct color labeling on the posttest. Subject [illegible] did not show as large an increase from the verbal pretest to the posttest as he did between the nonverbal tests. Further, his verbal posttest percentage of correct responses still remained well below the "cutoff" line, indicating that little "transfer" was realized in the verbal labeling responses of this S through completing the nonverbal color program. Subject [illegible] who demonstrated nonverbal color discrimination prior to taking the color program improved her color-labeling behavior even though that behavior was not directly reinforced on the nonverbal program.

DISCUSSION

Our interest in prosthetic programming led to the development of the described color program. Further, interest in the technology of programming per se also resulted in testing the acquisition of behavior not directly programmed.

The color program appeared to be adequate for teaching color discrimination [illegible]

The results of the verbal posttest when compared with the corresponding pretest [illegible]

FOOTNOTES

[1] This research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C. 20506. The opinions expressed herein are those of the authors and should not be construed as representing the opinions or policy of any agency of the United States Government.

[2] Now with Webster College, Webster Groves, Missouri.

[3] The "tokens" used were thin plastic chips taken from the Peabody Picture Vocabulary Test.

[4] The colored plastic stimuli used throughout the program and in the pre- and posttests were [illegible] [illegible]. These were purchased through the [illegible] [illegible] Co., Inc., [illegible] W. [illegible] Ave., Chicago, Illinois.

[5] See [illegible] [illegible] of the [illegible].

[6] For examples of fading procedures used in errorless discrimination studies see: Terrace (1963a and 1963b), Moore and Goldiamond (1964), Bijou (in press) and Sidman (1967).

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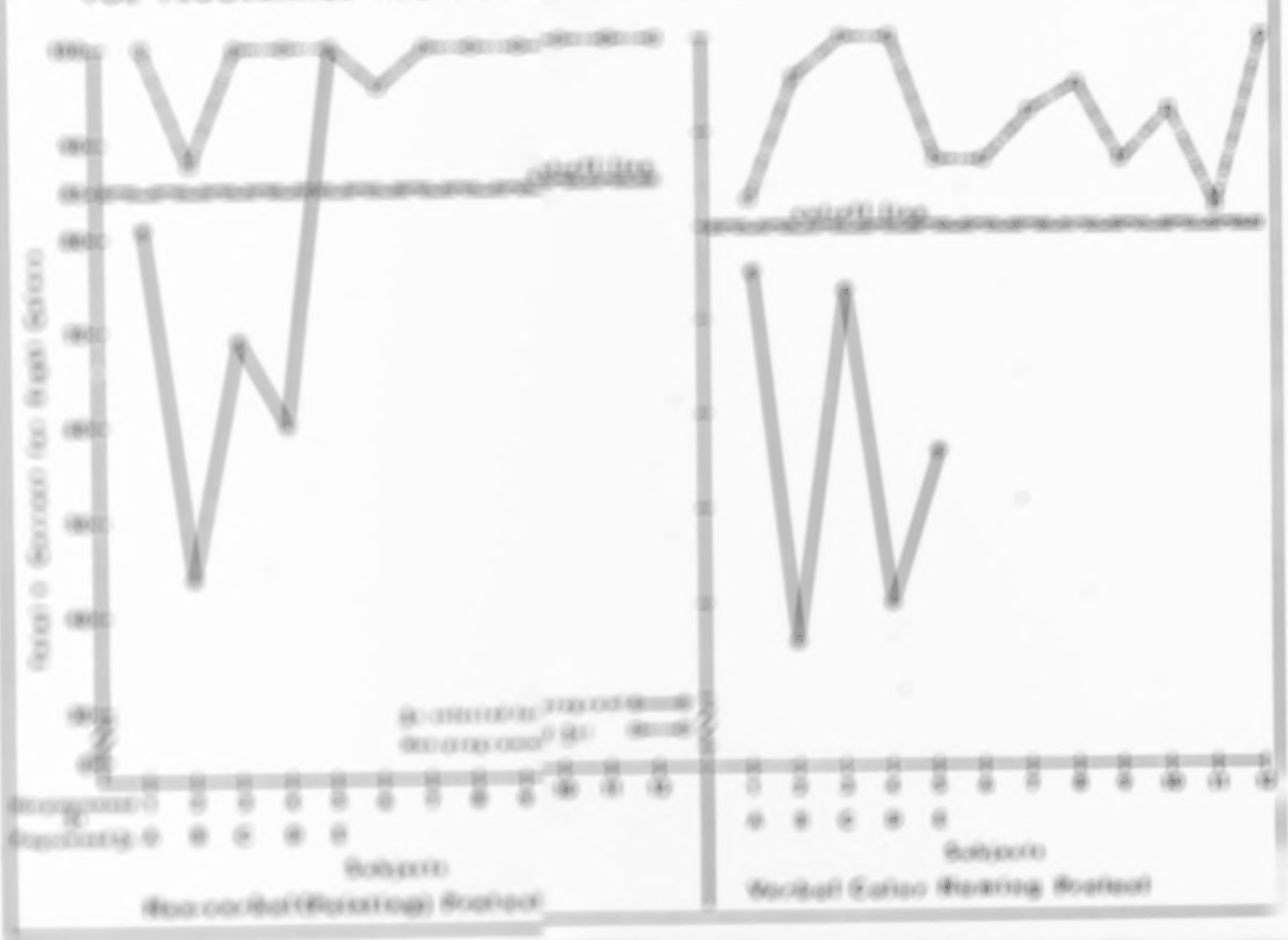

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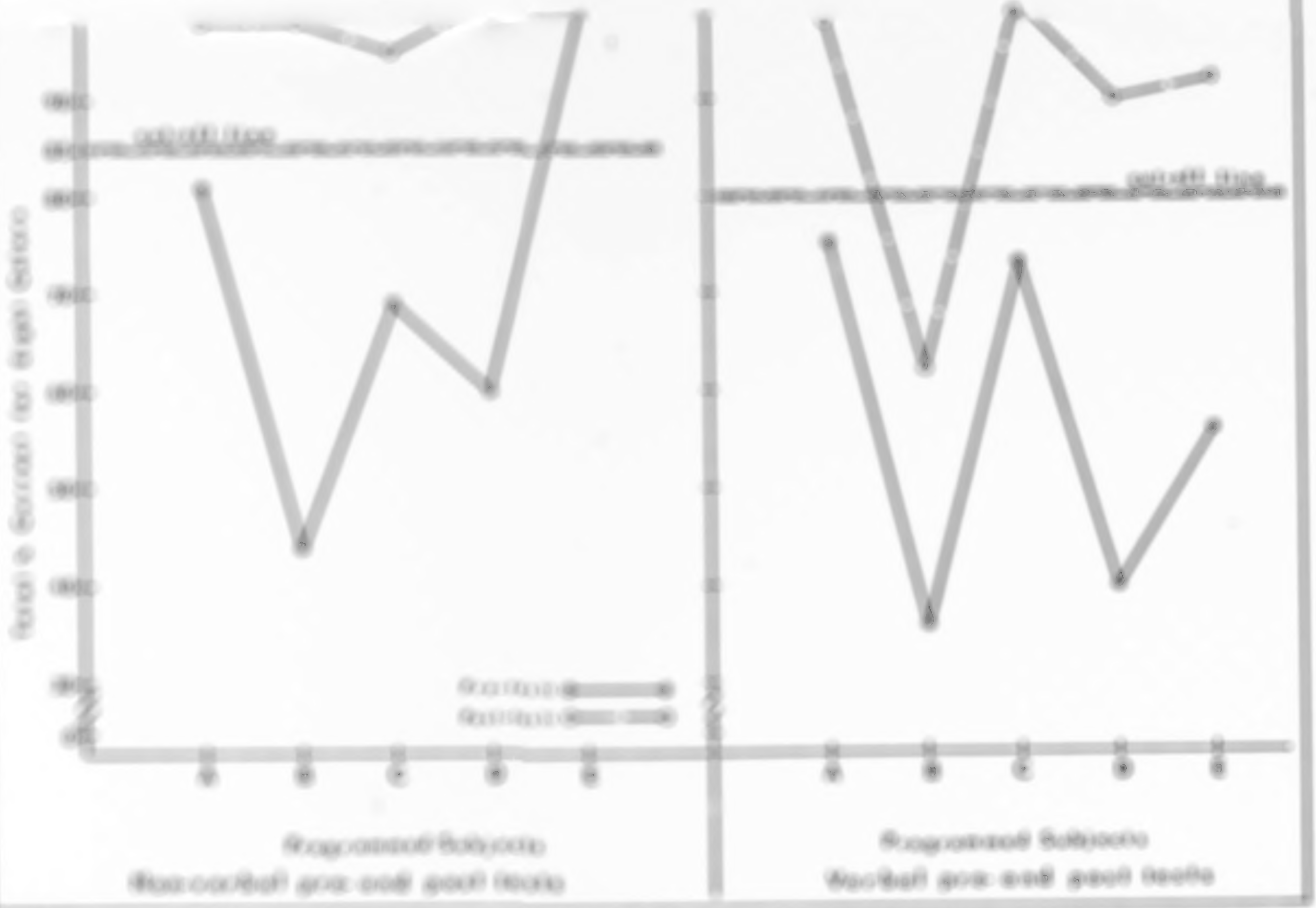

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push button. The brightness of the bulb lighting the push button was controlled by a 2000 ohm rheostat and a vernier dial which was calibrated in thirty equal dimming steps to control the light from full brightness to off.

A Gerbrands poker chip dispenser mounted behind the panel, outside the booth, delivered poker chips into an enclosed plastic container located beneath the push button manipulandum.

Control equipment was mounted on a relay rack outside the experimental booth. An interval programmer and interval timer were used to program the variable interval schedule. They were wired through an alternator which operated an electronic timer and stepper to program the delay period in 5" increments. The alternator was also used to turn off the response light and deliver a single tone of constant volume from an audio-signal generator at the completion of the VI response requirements. The alternator also controlled the delivery of a series of tones during the delay period. The series of tones was produced by running the audio signal through a multi-gang timer which produced a tone-on for 2/3 second and off for 1/3 second. The series of tones was controlled by a volume control of 10,000 ohms and a vernier dial calibrated in thirty equal steps to reduce the volume until it was inaudible. Both the single tone and the series of tones were delivered to the subject through earphones placed over a toy plastic army helmet with openings cut in the helmet underneath the earphones. The tones also came through a speaker mounted above the response panel. Both earphones and wall speaker were used in the event that if a S removed the helmet momentarily, he would still be presented the auditory stimulus.

White noise from a tape deck was delivered through a second speaker mounted on the wall of the booth to the left and above the subject. This was used to mask sounds produced by the experimental equipment.

A Gerbrands Harvard cumulative recorder was used to record responses during the VI period, mark reinforcements, and record responses made during the delay periods. A second pen was used to record the duration of the VI and the delay periods. Responses during the VI and delay periods were also counted on separate digital counters.

Procedure

There were two groups of Ss for whom the procedures were identical in all respects except the 60" delay period was gradually introduced for one group (Programmed Ss) and abruptly introduced for the other (Baseline Ss). This design represents two extreme conditions on a continuum of varying amounts of programming involved in establishing no responding during a delay interval. In later studies other Ss will receive varying amounts of programming between these two extremes so that samplings are made across the continuum in an effort to evaluate how much programming is necessary, and at what times.

Procedure, Baseline Subjects

The S was brought from the nursery school group to the experimental booth by E. The push button was lighted when the subject entered the booth, and white noise came from the speaker located on the side wall of the booth. The subject was told to sit in the chair facing the response panel, and the helmet with earphones attached was placed on his head. The experimenter demonstrated a button push as she said, "When you push this button, sometimes you get a chip."

After the poker chip fell into the container, the experimenter said, "When you have enough chips you can trade them for one of these toys." The subject was shown a box containing five toys, and asked which one he would like to work for today. When he had indicated a choice, the experimenter told him she would tell him when he had enough chips, and left the booth.

The number of training sessions each S received prior to the onset of delay conditions and the schedule of reinforcement for the individual sessions was determined by the response pattern of the subject. At first all subjects received at least six chips on a FI 15-sec schedule. If, at this point, their response rate was low with extended pauses between responses, further training on this schedule was given until the response rate increased. When possible the subjects were switched, after the initial six reinforcements on FI 15-sec., to either a VI 15-sec (range 3" to 27") or to a VI 5-sec (range 2" to 8") schedule. Two or three sessions on VI 5-sec or VI 15-sec in addition to the first FI 15-sec session were usually necessary for each Baseline Subject, since delay sessions were not begun until the subject achieved a stable response pattern on the VI schedules for two consecutive sessions.

Each reinforced button push during the initial training sessions resulted in three simultaneous consequence events: 1) the response light went off and came back on, 2) a single tone was presented through the earphones and the speaker above the response panel, and 3) a poker chip dropped into the plastic container beneath the response panel.

During delay sessions Baseline Subjects A, B, C, and D received 40, 60" delay periods divided equally over four sessions. Subject E received 41, 60" delay periods in five sessions. The third session for Subject E was terminated when the subject did not respond for seven minutes on the VI schedule following the third delay period of that session.

The delay condition for Baseline Ss was as follows: one interval of VI 5-sec with a subsequent response initiated a 60" delay period after which a poker chip was delivered. S began responding on a VI 5-sec schedule. The first response following each VI interval resulted in the response light flashing off and on while a single tone was presented simultaneously through the earphones and speaker. Following the light flash and the tone, the delay period began. Therefore a delay period followed each segment of the VI 5-sec schedule. After 60" the reinforcer (poker chip) was always delivered and the next interval of the VI 5-sec schedule began, thus repeating the sequence.

To initiate the delay, at least one response, following the VI interval, was necessary. If S responded during the VI schedule, but stopped responding before the interval was completed, the delay condition never began. Responding during the delay was without experimental consequences, although it was considered an error.

The baseline procedure can be thought of as representing a "trial-and-error" approach to the training of not responding during delay. There were no gradual increases in the delay periods nor were there any fading procedures used as will be described under the programmed sequence. The purpose of running the Baseline Ss was to determine if a preschool child could learn under trial and error delay conditions, to respond during VI but not during the 1' delay period. Figure 1, diagram 'B' shows a summary of the sequence of events for the Baseline Subjects which are the same as the terminal conditions for the Programmed Subjects.

Procedure, Programmed Delay Subjects

The programmed delay subjects received the same instructions and demonstration of the push button as was administered to the Baseline Subjects. Because there are slight procedural variations between the Programmed Ss, each will be separately described.

During the first training session for Subject 1, [illegible] chips were delivered on a [illegible] schedule, followed by [illegible] chips on [illegible]. The second training session was programmed on a [illegible] schedule with [illegible] chips delivered. The delay programming sequence began in the third session by inserting a 1" delay between the first response-to-reinforcement on a [illegible] schedule and the delivery of the chip. The delay interval was then increased in 1" increments each succeeding delay period. When the response-to-reinforcement was emitted, the response light darkened and remained dark for the duration of the delay. Simultaneous with the response light going off, a tone sounded through the earphones and speaker which was followed by a series of tones sounded at 1" intervals for the duration of the delay. At the end of the delay period, regardless of the length of the delay, a poker chip was dispensed, the series of tones ceased and the response light was turned on. The delay period was increased from 1" to [illegible] during the first session, and from [illegible] to 60" during the second session.

The third, fourth and fifth sessions of programmed delay consisted of [illegible], 60" delay periods. During these sessions the response light was increased to full intensity in [illegible] steps. The series of tones was terminated [illegible] prior to the end of the 60" delay on the first sequence of the third programmed session. It was shortened by [illegible] for each subsequent delay period. Simultaneous with shortening the duration of the series of tones, the volume of the tones was also decreased in [illegible] equal steps until inaudible.

In the final condition of the programmed delay the response light was on at full intensity and a [illegible] schedule was in effect. When the response-to-reinforcement was emitted, the response light flashed off and immediately a single tone sounded through the earphones and the speaker, and there was a delay of 60" prior to the delivery of the reinforcement (poker chip). These were the same conditions as those for the Baseline Ss in all delay sessions.

Insert Figure 1 about here

Subject 2 had a prior history of refusing to participate in experimental work and required training sessions different from those given to the Baseline Subjects or to Subject 1. The Head Teacher of the preschool accompanied S_2 to the experimental booth. S_2 was persuaded to push the button once for a poker chip the first day. The second day the session was terminated when Subject 2 cried after receiving six chips on a [illegible] schedule. The third day S_2 sat on the Head Teacher's lap and received a chip for every button push he made. E, observing from the back of the booth, activated the poker chip dispenser with a hand switch. The fourth day S_2 sat in the chair and wore the earphones for the first time. The Head Teacher sat in the rear of the booth. The Experimenter continued to use the hand switch during the initial delay periods of 1" to 10" (in 1" increments) by counting the tones and operating the poker chip dispenser. Beginning with 10" delay he was placed on the automatic equipment and was advanced to 22" delay on this session. The following session was started with a 10" delay and was advanced to 32" in 2" increments. The Head Teacher accompanied him to the booth for this experimental

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RESULTS

Figure 2 depicts the individual response pattern of the Baseline Subjects [illegible]

Insert Figure 2 About Here

[illegible]

Figure 3 shows the response curve of the Baseline Subjects on the last day of responding under non-programmed delay conditions. The cumulative curves are from 60'' delay periods [illegible] to [illegible] for Subjects [illegible]. For Subject [illegible] it shows the curve for the 60'' delay periods [illegible]. Subject [illegible] emitted [illegible] responses during VI and [illegible] responses during delay for this session. Response totals for the other Baseline Subjects during VI schedule and delay periods are not available. The cumulative curves of all five subjects under non-programmed delay indicate responding (errors) during the 60'' delay periods.

Insert Figure 3 About Here

For Subject [illegible] the record of the last session indicates a tendency to pause prior to reinforcement, but many errors were made during the 60'' delay period. Subject [illegible] showed no discrimination between VI 3-sec and delay conditions. His rate remained high and steady throughout. Subject [illegible]'s records also indicated no discrimination formation between the two conditions as there is a low steady rate across both the VI and delay conditions. The response curves of Subjects [illegible] and [illegible] show longer periods of no responding than the first three Ss. However, in many instances there are bursts of responses during the delay period or at the end of delay (just prior to the reinforcement hatch mark). None of

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Figure 2 shows [illegible]

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Insert Figure 2 About Here

Figure 3 depicts the cumulative response curves for the Programmed Delay Subjects during the delay periods. [illegible]

The cumulative curves for Subject 1 indicate a discrimination was established between the conditions of TO S-tone and delay. There is a sharp increase in response rate following the reinforcement during the TO S-tone condition. Responding stops during delay except for a few isolated responses (errors). Of the 30 errors that Subject 1 emitted for all five sessions only a small number of these were errors (responses) that occurred within the delay period after S1 had stopped responding on the TO S-tone condition. The rest of the errors could be called "spill over" errors which are continued responses after the TO S-tone condition stops and delay starts.

Subject 2 was hand shaped during the first session to a 10" delay in 2" increments on successive trials. He was then switched to the automatic program which increased the delay in 2" increments to a 10" delay period. S2 emitted 80 responses during CRF and TO S-tone and 1 response during delay. The second session was started with a 10" delay period which increased to 30" during that session. He emitted 38 responses during TO and 0 responses during delay. Within sessions 3 and 4 S2 was advanced from 30" to 45", and from 45" to 60" delay periods, respectively. There were 20 TO responses and 0 delay responses during Session 3. There were 17 responses during TO and 0 responses during delay during session 4.

In each of sessions 5, 6 and 7 there were 10, 60" delay periods, with the response light increasing to full intensity and the series of tones decreasing in duration and loudness in 30 equal steps.

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DISCUSSION

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The Baseline Subjects, when introduced to non-programmed delay, did not make a discrimination between responding during the S^D and not responding during delay. Two of the three Programmed Subjects were able to approximate an errorless discrimination between conditions for functional responding and those which were not. Gradually increased delay periods and fading procedures of both light and tone (duration and intensity) appear to be fairly successful for the first two Programmed Delay Subjects.

The responses of Subject S_3, however, did not appear to be controlled by the programmed stimuli. It would be difficult to argue that S_3 was not under reinforcer control since the overall response rate was fairly high. S_3 was continued on the program, in spite of errors, so that response curves could be compared at the end of the program with those of the Baseline Ss. S_3's

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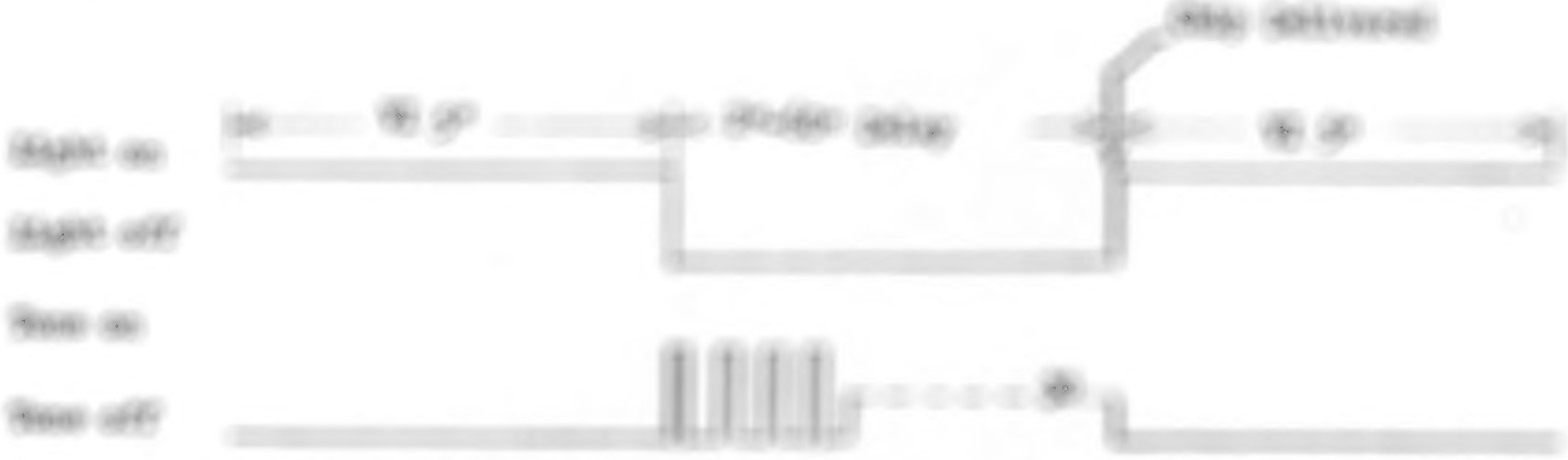
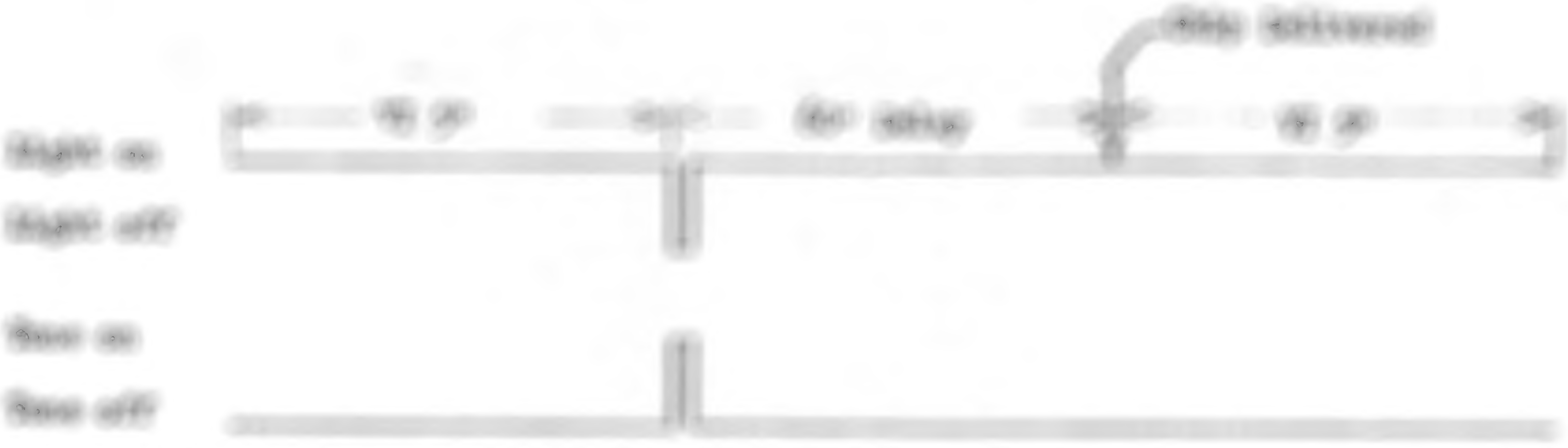

Light on
Light off
Tone on
Tone off

A: Tone and light conditions first phase of programmed procedure


Light on
Light off
Tone on
Tone off

B: Terminal tone and light condition of programmed procedure and only condition for baseline subjects.

Fig. 5. Tone and light conditions during first phase and terminal [illegible] of programmed procedure and [illegible] conditions for baseline subjects.

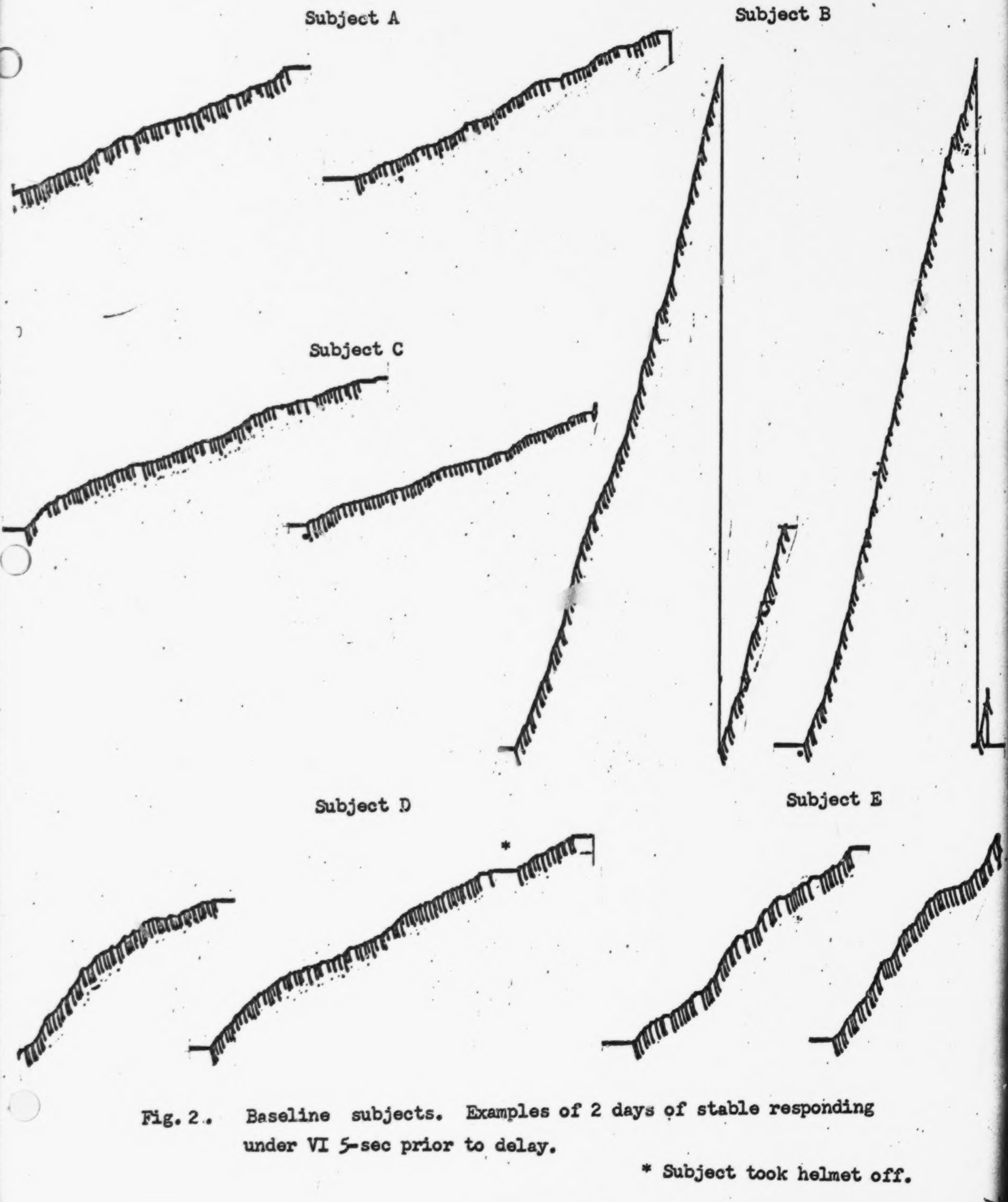
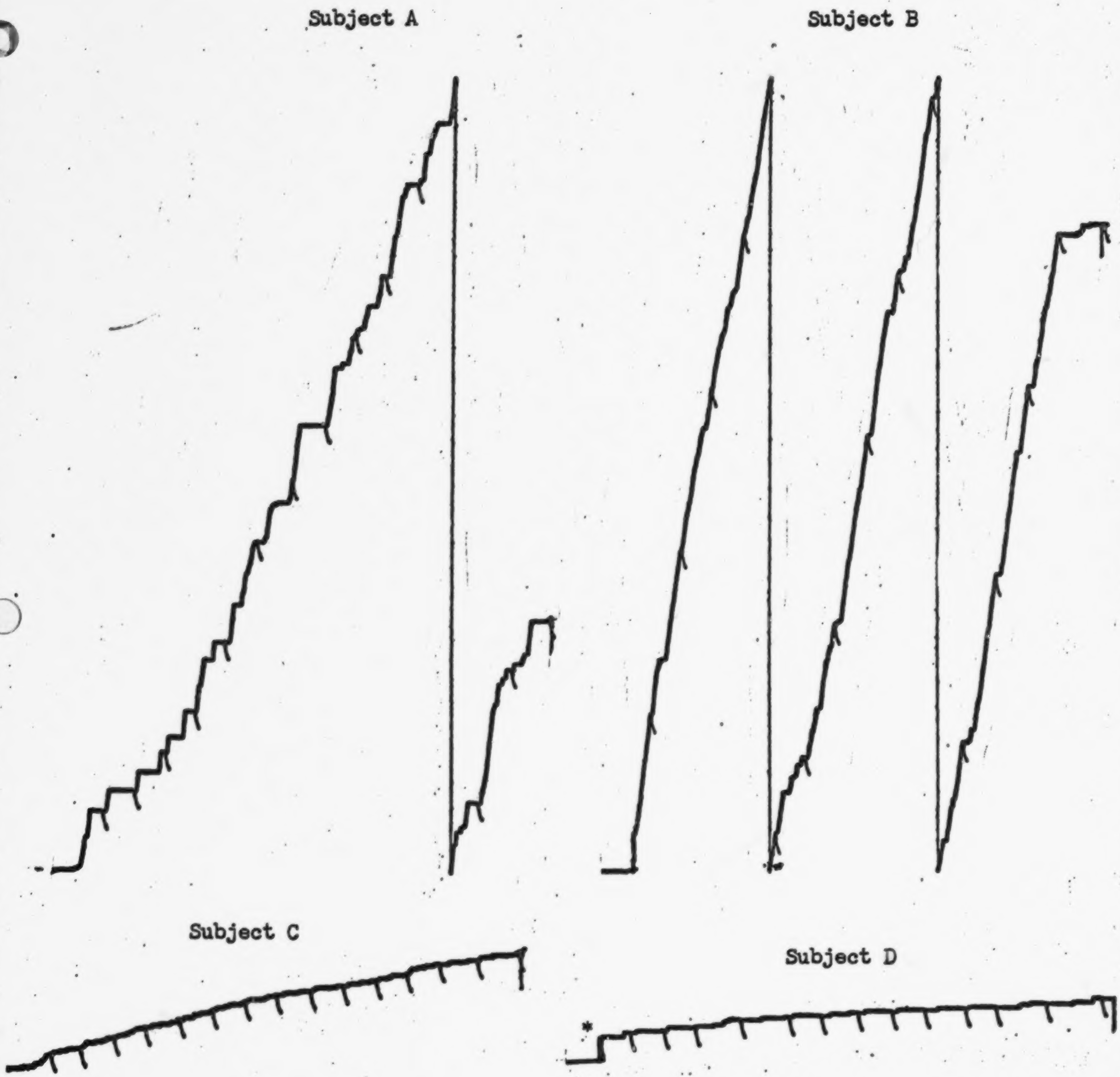


Fig. 2. Baseline subjects. Examples of 2 days of stable responding under VI 5-sec prior to delay.

* Subject took helmet off.



Subject A

Subject B

Subject C

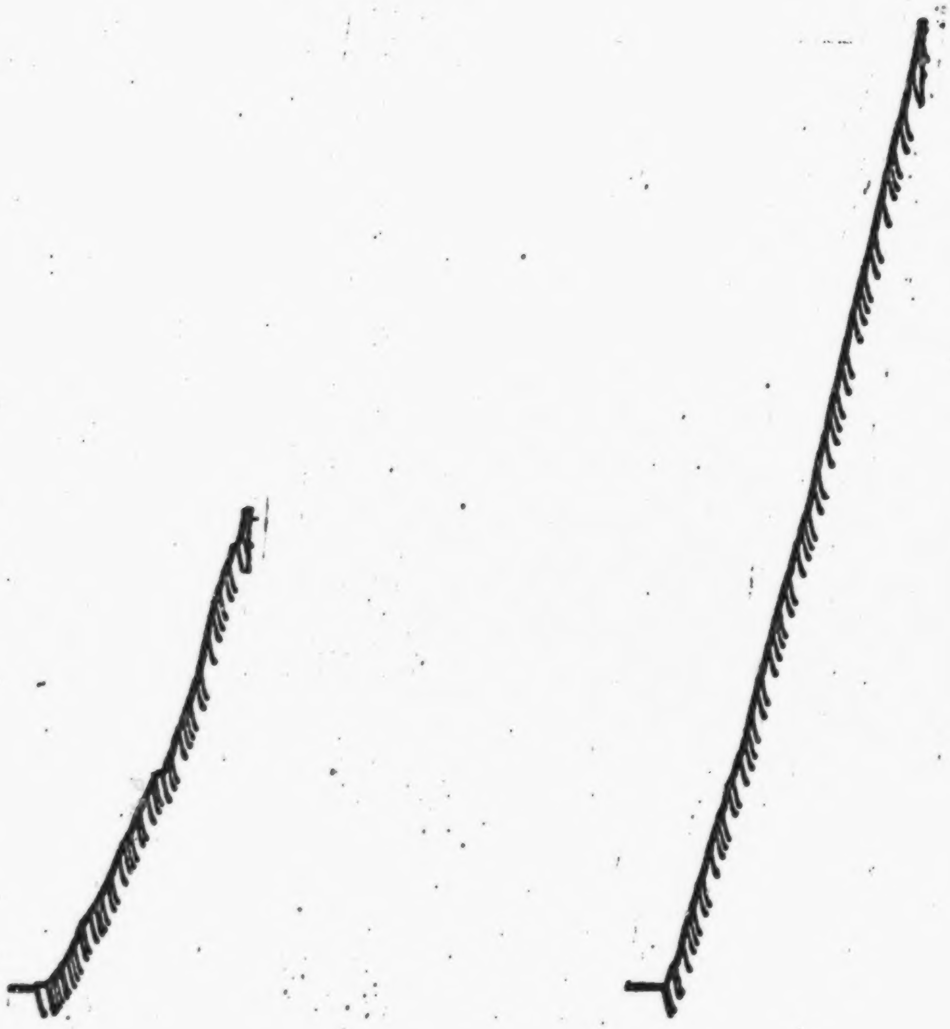
Subject D

Subject E

Fig. 3. Baseline subjects. Examples of last day of responding under non-programmed delay conditions.

*Cumulative recorder motor off for first 2 delay periods.

Subject 1



Subject 2

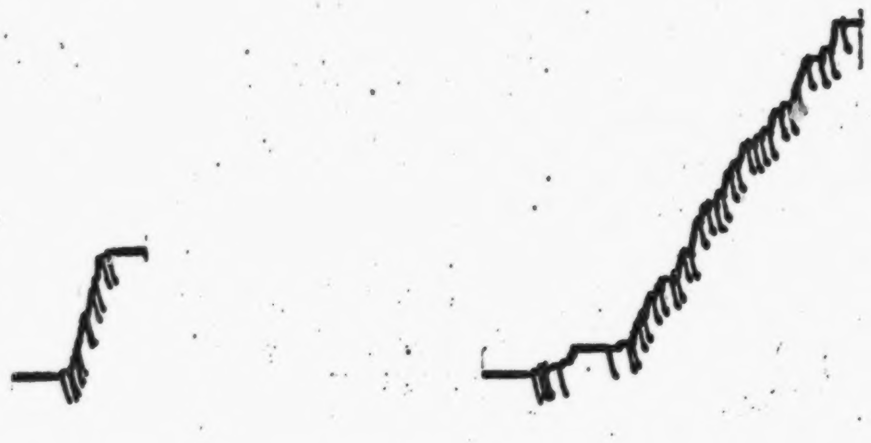
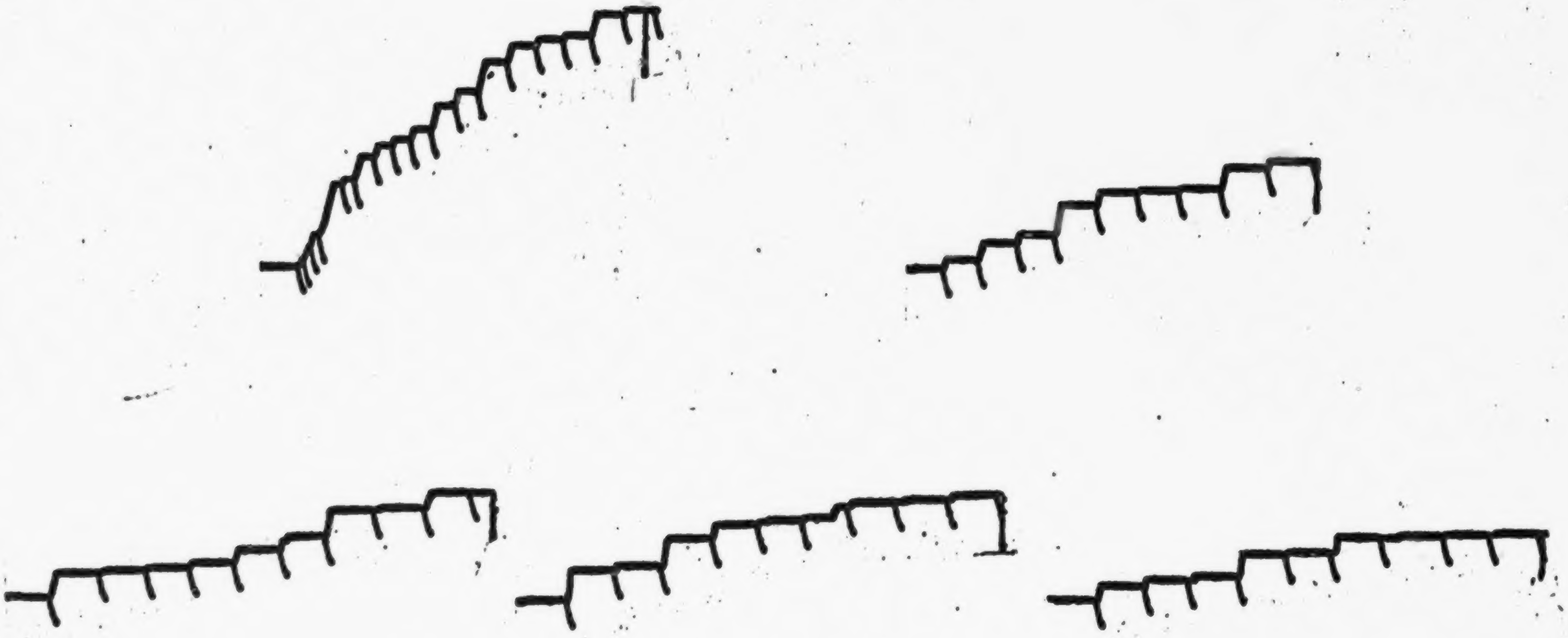


Fig. 4. Programmed subjects. Examples of 2 days of stable responding under VI 5-sec prior to delay.

Subject 1.

Sessions 1 and 2 take subject up to the 60-sec delay with light off and tone on during delay. Sessions 3,4, and 5 continue on 60-sec delay with light fading on and tone fading out.



Subject 2.

Session 1 was hand shaped for delay increments of 1-sec to 10-sec. Subject then placed on automatic equipment and increased to 20-sec by 2-sec intervals. Session 2,3, and 4 took subject to 60-sec delay with light off and tone on. Sessions 5,6, and 7 continued subject on 60-sec delay with light fading on and tone fading out.

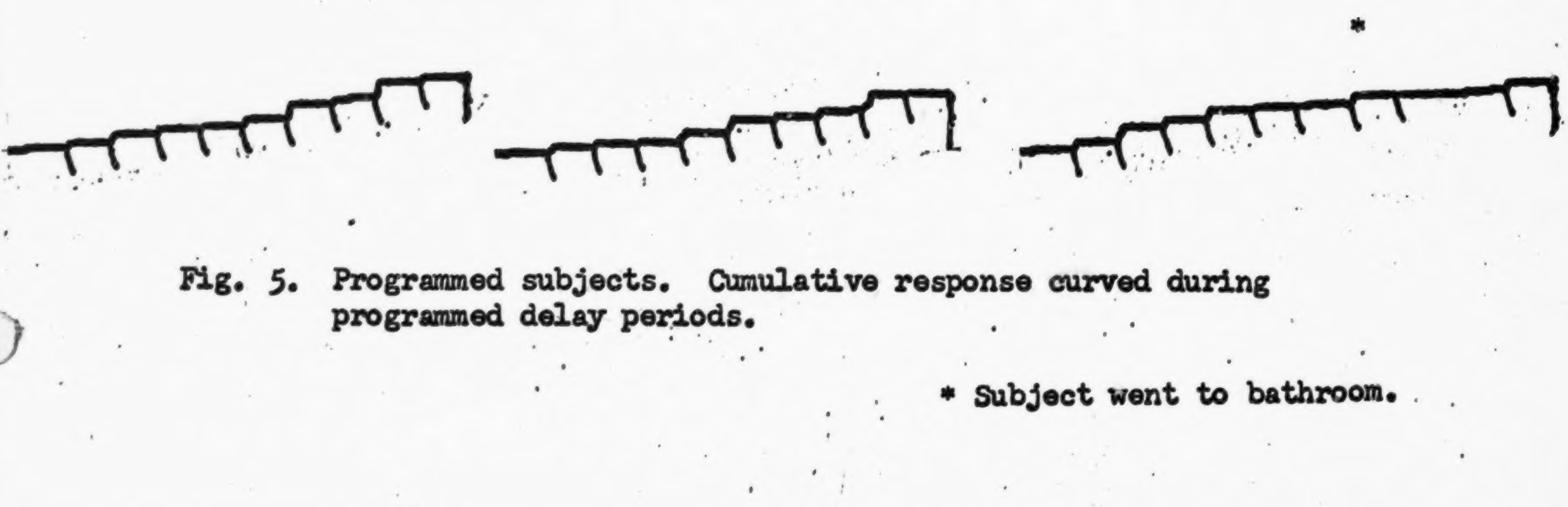


Fig. 5. Programmed subjects. Cumulative response curved during programmed delay periods.

* Subject went to bathroom.

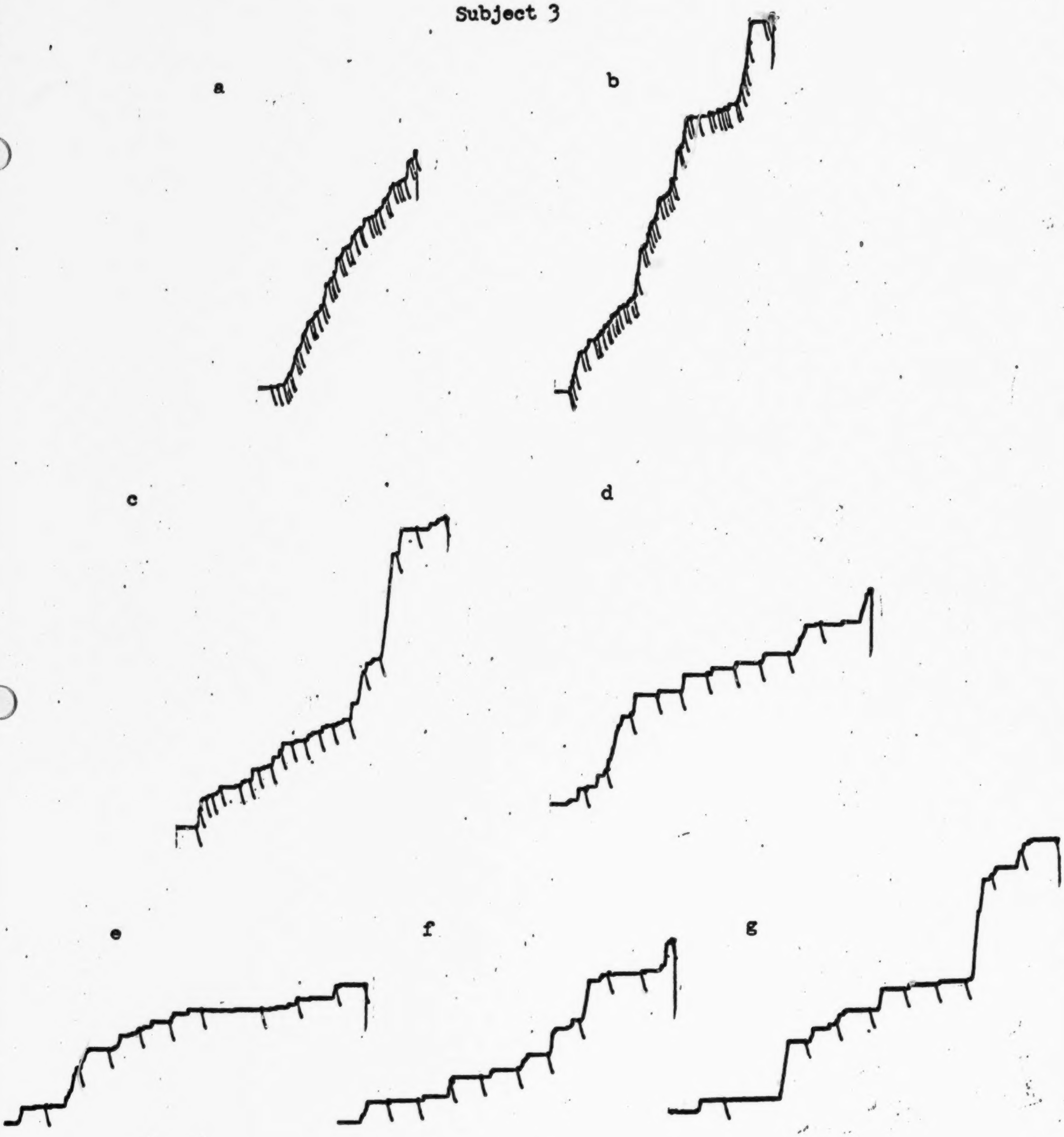


Fig. 6. Programmed subject. Cumulative response curves: a, b - VI 5-sec training; c, d, e, f, g - programmed delay periods for 5 consecutive sessions.

The University of Kansas Head Start Evaluation and Research Center

VII D

"A Case Study Illustrating an Experimental Design for Evaluating the Effects of Shaping Gross Motor Coordination in a 31 Month Old Child"

Mary Lou Michealis B.A.
Barbara C. Etzel Ph. D.

Department of Human Development

A Case Study Illustrating An Experimental Design for Evaluating the Effects of Shaping Gross Motor Coordination [illegible] in a 31-Month Old Child[1]

Mary Lou Michaelis[2] and Barbara C. Etzel

ABSTRACT

Running head: An Experimental design for shaping gross motor responses.

A multiple baseline design was described and utilized in the training of gross motor responses in a young preschool child. The responses of sitting and scooting decreased over time as the responses of walking, getting up without support and climbing steps were shaped and increased in rate. Standing without support was not trained but was observed to increase as a result of the experimental procedures employed.

A CASE STUDY ILLUSTRATING AN EXPERIMENTAL DESIGN FOR EVALUATING THE EFFECTS OF SHAPING GROSS MOTOR COORDINATION IN A 31-MONTH-OLD CHILD[1]

Mary Lou Michaelis[2] and Barbara C. Etzel
The University of Kansas

The fruitfulness of behavior modification procedures as applied to a wide variety of problems has been obvious through the increased literature and interest in the field. Equally striking is the fact that the same principles are used regardless of the problem behavior studied. Bijou and Baer (1967) indicated when the same behavior modification principles are successfully applied that no clear or useful distinction between the areas of, e.g., child therapy or rehabilitation need be made. An experimental analysis approach is perhaps changing the psychologist back to a generalist.

A set of experimental procedures common to many behavior modification studies involve: "baseline" records of operant level of responding; the application of contingent reinforcement to desired behavior (with concurrent extinction of undesired behavior); reversal of procedures (after modification has occurred) so that baseline conditions are reinstated; and finally a return to contingent reinforcement with a thinned schedule being used at the end to ensure "durability" of desired responding.

One of the problems of the above sequence of procedures is that on occasion behavior does not return to its original baseline under reversal conditions. Hence, the experimenter cannot always conclude that the procedures he used to modify the behavior were responsible for the change during the "contingent" condition. Sidman (1960) has written most extensively about the irreversibility problem. If the original independent variables did in fact produce the behavioral change, then the question becomes one of why these variables are now insensitive to manipulation. Sidman has emphasized that irreversibility can and should be accounted for. One approach he suggests is to identify what variables are responsible in those instances in which irreversibility appears.

Baer (1967) attended to the problem of irreversibility that occurred during several studies of social interaction in preschool children. His analysis, which includes a design for studying the irreversible process, also suggests some variables that may be responsible for a later insensitive independent variable, such as the reinforcing aspects of teacher attention to peer interaction. In likening the preschool environment to a mouse trap, Baer suggests that once an entry response has been accomplished (that is, a child has been reinforced for and is interacting with other children), very soon a larger community of mutually reinforcing contingencies will occur between child and peers. Thus to "extract" the child from this now natural environmental "trap" of reinforcing contingencies is almost impossible. Reversal procedures are not effective in returning the child's behavior to the previous baseline rate.

To carry Baer's analogy a bit further, one might say that some behaviors when modified may result in an environment in which only a few additional reinforcing stimuli are produced for a child--that is, the mouse trap has a weak spring. The child can easily slip in and out, hence reversibility can be easily shown in experimental procedures. However, other behaviors when modified may produce further massive environmental consequences beyond those of the specific behavior which was altered. The added reinforcing stimuli are many and perhaps, even more immediate. Here the trap can be likened to a strong-spring bear trap (bear as in infra-human animal, not our esteemed Homo Sapien colleague).

The problem of how easy it is to apply reversal procedures can be conceived of as a function of how much the newly acquired behavior results in altering the child's total environment with respect to amount and immediacy of new reinforcing stimuli available to him. Also a setting event, such as amount of deprivation, may be a factor.

Studies dealing with altering self-destructive behavior in retarded or autistic children have successfully used reversal procedures (Lovaas, et al., 1965). Wolf, et al. (1964), demonstrated that glasses-throwing was easily reversed and Harris, et al., (1964), reversed regressed crawling. Each of these studies in the area of child therapy no doubt were successful in using reversal procedures because the reversals were initiated early, before other aspects of the environment became reinforcing over and beyond the reinforcement provided specifically to modify the behavior. Baer stresses the time of instituting reversal procedures as critical in social interaction studies.

It is probably quite true that reversal procedures are difficult to implement in some studies of social interaction, especially if not applied soon after the desired response has become consistently observable. It would appear, however, that reversal may be impossible or difficult to implement in some areas of gross motor behavior. In a study in which walking behavior is shaped from scooting behavior, it is possible that the newly differentiated response leads to such massive environmental changes for the subject that reversal is impossible. A child who now walks, rather than scooting on the floor, comes into contact with many new toys that were previously unavailable, more immediate contact with the stimuli in his environment, and a rich schedule of adult attention, due at least in part to increased mobility on the child's part. Also adults will certainly observe the obvious difference in the child's behavior (social interaction may not be so obvious), and an immediate response on their part should occur, especially since the child's altered behavior does remove many aversive stimuli for the parent.

It would therefore appear that even though the principles are the same across behavior modification studies, there are alternative designs experimenters may have to use in an individual analysis approach to modifying problem behaviors. Hence, the modification principles may not separate the areas of rehabilitation or child therapy as Bijou and Baer agree, but perhaps different experimental designs are necessary to enable the experimenter to demonstrate his effectiveness.

An experimental design incorporating reversal procedures to demonstrate controlled modification, does not seem applicable for those behaviors which, when finally emitted, produce massive environmental consequences beyond the immediate contingencies surrounding the specific behavior that was modified. It is quite possible that these environmental consequences will quickly begin to exert more control over the behavior, once established, then the limited variety of reinforcers available in any experimental setting. Thus, in such situations the probability of obtaining a sustained reversal of the newly acquired behavior or an increase in the less desirable behavior, which produces fewer environmental consequences for the child, is quite small.

Another design which could demonstrate, equally well, experimental control of the modified behavior without using reversal procedures would seem more applicable. One such design is the multiple or concurrent baseline procedure. In such a design, several behaviors are observed concurrently so that an operant (baseline) level is established for all of them. The categories of these behaviors to be chosen are: 1) The behaviors the experimenter choses to manipulate; 2) Those he may want to observe for generalization effects of the manipulations; and 3) Those which may be altered as a consequence of manipulating other behavior but which do not necessarily lie on the generalization continuum. Subsequent to obtaining the operant levels of these behaviors, modification procedures are applied to one of the behaviors to be modified while all other behaviors remain under continuous observation. When this first behavior begins to show the desired directional change then procedures are begun for the second, third, etc. If there is a change in the responses of the subject following manipulation procedures for the particular response being modified and if this process is replicated across behaviors for the same subject, it then appears highly probable that it is the experimental procedures which are responsible for these behavioral changes and not some unknown correlated incident.

Baer and Sherman (in press) have described in detail a design such as the one above for use with operant therapy studies. Meyerson, _et al_. (1967) reported several procedures employed to teach a mentally retarded child to walk. They collected data on several different aspects of her walking behavior and presented the sequence of changes across training sessions. This design approximates the multiple baseline design but is limited because their data is based only on the behavior emitted in the training session. This type of data is extremely susceptible to the training and reinforcement procedures used.

Optimally, a multiple baseline design is best applied when the experimenter trains the subject in the natural environment. Then those behaviors under observation are "free" to be emitted or not, thus providing a constant baseline of several behaviors which can be compared during and after specific training procedures. This "freedom" is not provided in restrictive or atypical environmental settings. This would mean that modification produced within the natural environment and measured there or that produced in a laboratory setting and measured in the natural setting could provide fruitful data concerning the effects of modification procedures.

The study reported in this paper utilizes a multiple baseline procedure. Behaviors were chosen for observation prior to the beginning of the study and procedures worked out for observing and recording data. Although modification of the behavior was carried out in a laboratory setting, the majority of the observations plotted were in a natural setting. Baseline data was collected on all behaviors. One at a time modification procedures were applied to each of the behaviors to be modified. The design was chosen because we suspected that gross motor behaviors such as walking, getting up from the floor unsupported, and climbing steps was one of the categories of behavior which would be difficult to reverse because of the large number of additional reinforcers which are available and which probably have more reinforcement value than those reinforcers used originally to modify the behavior.

METHOD

Subject

The subject was a 31-month-old male attending the University of Kansas Infant Study Laboratory when the study began. A medical diagnosis included a suspected arrest of hydrocephalus. The slow development in both motor and language areas was therefore attributed to congenital brain damage. He was also a subject in another experiment during this time.

Although most of the components of a full-blown walking response had been observed to be a part of S's repertoire, his walking behavior appeared to be under the stimulus control of certain environmental props affording support. He exhibited a walking response only when some supportive agent was available. S's consistent response when support was withdrawn was to sit down on the floor immediately. His primary means of locomotion was to sit on the floor and scoot by pulling his body forward with the combined force of his legs and arms. S's parents reported repeated unsuccessful attempts to get him to take a few steps alone.

Experimental Design

During informal observations of S in the Infant Study Laboratory and from conferences with his parents and preschool teacher, a group of behaviors were decided upon for observation and possible modification. Two general categories of these behaviors were used: 1) those which were desirable, i.e., standing, walking, getting up, and climbing stairs without support; and 2) those which were incompatible (could not be emitted simultaneously) with the desirable, i.e., not standing, scooting, pulling up with support and not climbing stairs. These were further classified into: 1) Those behaviors to be increased in occurrence through experimental procedures, i.e., walking, getting up, and climbing stairs without support; 2) Those behaviors to be decreased through experimental procedures, i.e., scooting, pulling up, and not stair climbing; and 3) Those behaviors which might not need direct modification but might increase as a result of increasing desirable behaviors and decreasing behavior incompatible with the desirable ones, i.e., standing without support. It should be noted that the behaviors chosen to increase during modification procedures were at a zero operant (baseline) level as was the behavior determined not to require direct modification.

The design therefore follows the multiple baseline approach. Figure 1 represents a smoothed graphic conceptualization of how the data might appear in such a design over the course of the study. From the graph it can be seen that sitting and scooting behavior were anticipated to appear at high frequencies of occurrence during baseline. Our preliminary observations indicated that walking, standing without support, getting up without support and step climbing would all be at zero operant level during baseline and would remain there until training on each of the separate behaviors was begun. The behavior that was not to be trained (standing without support) was expected to increase in rate sometime after the actual walking began. Further, we expected sitting to begin to decrease soon after walking began but to level out at an appropriate point since all preschool children do sit for periods during the classroom session.

Insert Figure 1 about here

The frequency of scooting, on the other hand was expected to rapidly decrease after walking began but not to a zero response rate until after S was trained to get up from the floor without support. Walking, step climbing and getting up without support were expected to remain at their zero baseline levels until specific training for each of these behaviors began. Additionally, because the observations were being recorded in the child's natural preschool environment, and the training in an experimental room, it was thought that some time would elapse before the effects of training would generalize to the preschool setting. Therefore increases in walking, getting up and step climbing should be somewhat delayed in rate increase subsequent to the onset of training.

Experimental and Observation Settings

The first experimental training area was a large, relatively bare room with a small observation room adjacent to it. This room was located in the University of Kansas Infant Study Laboratory.[3] The second experimental area was another large, relatively bare room (though more objects were present along the walls, such as chairs and tables) with an observation booth extending the full length of one wall. This room was located in the Preschool Laboratory on the second floor. A training area, used for a short while during the final training procedures was the actual classroom of the Preschool Laboratory, which consisted of two quite large, connected rooms equipped with the standard nursery school materials. There were 20 children ranging in age from three to five, attending the summer preschool session during which the final phases of this study were completed.

Observations of S's behaviors were recorded in the above experimental training areas in addition to the Infant Study Laboratory classroom in the initial phases of study. This classroom was a large playroom also equipped with the standard nursery school materials. There were a total of five children, ranging from 25 to 31 months of age, attending the same 1½ hour session as S. The class sessions were held twice a week with the same group of children and the daily schedule consisted of 45 minutes of free play, followed by handwashing and a snack and then another shorter play period which was frequently held outside, weather permitting. Approximately one month after the classroom observations in the Infant Study Laboratory were discontinued in the summer, observations were also recorded in a private nursery. The differences between this setting and the Infant Study Laboratory were that 20 children were in attendance and the age range was from 3 to 4 years. Also movement was somewhat restricted because the majority of the activities were carried out while seated at a table.

Recording of Observations:

At the beginning of the study three observers were trained to record S's motor behaviors in the classroom setting. The observers were simultaneously employed as research assistants for the University of Kansas Head Start Evaluation and Research Center and consequently, had a considerable amount of previous training and experience in observation and recording.

Categories of motor responses to be observed were decided upon. Table 1 presents the symbols for each category and corresponding response definitions.

Insert Table 1 about here

Observation recording sheets were divided into blocks representing 15-second intervals. If two or more different responses occurred within any 15-second interval, the corresponding symbols were all recorded in the block for that interval. If the same response occurred twice within one interval (e.g., walking more than 2 steps), the corresponding symbol was recorded only once in the block for that interval. Therefore, the percentages plotted on the graphs reflect percentages of 15" intervals in which a particular behavior occurred.

The reliability of all three observers was checked periodically throughout the study.[4] After a high degree of interobserver reliability had been established in the initial phases of the study, three observers were not used every day. Most observations were recorded simultaneously by at least two observers but for some days only one observer recorded.

This method of observation was used as an ongoing generalization measure of the responses being shaped in the training sessions. Therefore observations were recorded in the classroom setting of the Infant Study Laboratory until it was discontinued for the summer, for two days in a private nursery setting during the summer, and for three days in the middle of the summer at the Preschool Laboratory summer session.

Within the training sessions it was impossible for an observer to reliably record those behaviors chosen for training. Because gradual changes in the response topographies were the objectives of the training session procedures, it was impossible for an observer to reliably record those behaviors chosen for training during their acquisition. One reason this was impossible was because a shift in support used by S was a criterion for differential reinforcement. Because E was physically manipulating this support she could determine the amount of weight or pressure S applied to the supportive agent. These shifts were felt by E only and visually observed by no one. It was also impossible to establish criteria which could be used for recording lifting feet. These responses occurred too rapidly in succession for reliable measureable recording. Furthermore, to isolate the effects of E's delivery of reinforcers upon the observer's judgement of the specific response in question could not be done. Therefore during the training sessions the observer recorded only time, number of reinforcers, auditory and discriminative stimuli presented by E, specified response emitted by S and unusual occurrences in the sessions. The combined data obtained from probe test sessions which occurred after each training session, and movies filmed during each phase of the training sequence, were the criterion upon which the decisions were made for altering training procedures and/or moving forward within a specific unit of training.

Probe Tests

Probe tests were administered during all three phases of training: 1) Walking-Training, 2) Getting-Up-Training, and 3) Step-Climbing-Training.

During the Walking Training Probe Tests, it was necessary to take S to a room other than the experimental room because he was never permitted to scoot in the experimental room during the initial phases of training. In the probe room, a toy was placed in the corner and a table in the middle. E placed S standing beside a table. S was told to come to E who had moved to the corner beside the toy. S was permitted to use any method of locomotion he chose and no supports were available for him to use. The response measures recorded during this phase were the number of steps and the number of scoots S emitted in reaching E and the toy.

Because getting-up training was started while step-climbing training was ongoing, the probes from the step climbing provided the probe data for getting up without support. Films taken of the training sessions were subsequently analyzed to determine the response acquisition.

To probe test step climbing, three 4" steps were set up in an arrangement which allowed S to climb up three, walk across the top, and climb down three. S was allowed to use any means of locomotion he chose to get to the top where a toy had been placed. After playing with the toy for a few seconds, E stood S up, if he was sitting or in a crawling or scooting position, and then allowed him to go down the steps, under whatever means of locomotion he chose, to obtain a toy from a table at the foot of the steps. All probes were filmed, as well as S's stair-climbing behavior in the University Preschool Laboratory.

The use of probes subsequent to experimental sessions compounds the experimental design, i.e., the probes were used to test the effectiveness of the experimental session training in terms of response acquisition, and the continuous observation recordings in other settings provided information regarding the use of these responses in those settings (generalization of response to new environments). Such a design provides information to the experimenter regarding when the response is acquired, and subsequently when it becomes strong enough to generalize to other environments without specific procedures provided for generalization. Since this information is available simultaneous with training, it is possible to use it for guiding the experimenter when making training decisions.

Reinforcers

It had been noted prior to the initiation of training procedures, that opportunities to handle and play with toys could possibly serve as a reinforcer for S. However, the difficulties involved in immediate delivery of such reinforcers, contingent upon subtle variations in S's behavior, in addition to the frequent interruptions of training to allow S to play with the toy, made using this as the sole reinforcer impractical. Therefore, S's parents were asked to feed him an early lunch and skip his usual post-nap snack in order to increase the effectiveness of small edibles as reinforcers. The opportunity to play with a toy was therefore made contingent upon a fairly long series of small responses, some of which were differentially reinforced with the edibles.

Single steps, or a small series of steps, were differentially reinforced for those variations determined by E to be closer to independent walking behavior. These variances, upon which the judgements were made, were: decreasing the amount of weight which was placed upon the supportive object, decreasing the firmness of grip on the support, taking steps in a forward direction rather than sideways, and lifting his feet off the ground rather than shuffling. Similar procedures were used for shaping the components of the "Getting-Up" response and the "Climbing-Steps" response.

At one point in step-climbing training, a conditioned reinforcer, in the form of a "token" (small plastic chip), was used. After climbing up and down the steps, S was permitted to take a token from a cup and put it into a box. When all the tokens were transferred from the cup to the box, they could be redeemed for a small toy which S could keep. The conditioned reinforcers were not very effective for maintaining S's step climbing, possibly because the response requirement was out of proportion to the conditioned value of the reinforcer. Because of the interruptive qualities of beginning at the first stages of establishing a conditioned reinforcer, i.e., presenting the token and allowing immediate trade for small edibles, the token procedure was discontinued after only a few sessions in favor of the original reinforcement procedures.

Pretraining

For purposes of gaining instructional control, i.e. for E's vocal instructions to become auditory stimuli discriminative for reinforcement subsequent to a correct response following the instruction, a series of shaping procedures were initiated. E stood S next to a low table for support and issued the auditory stimulus, "S, come here". If S moved only a few inches in E's direction, reinforcement was delivered. The distance between E and S was gradually increased until S was walking with support for ten feet.

It was anticipated that certain elements of the program for training walking without support would require S to emit matched-dependent, imitative behavior. E presented the auditory stimulus, "S, do this," and demonstrated physical models of simple motor behaviors, such as tapping the table, holding up one hand, etc. (Baer, *et al.*, 1967). The purpose of this procedure was to extablish an imitative repertoire for S over a wide range of behaviors and thus provide the tool of imitation for shaping elements of other behaviors.

General Procedures

Although S did not stand without support it was posited that this response would become a part of S's repertoire as he began to walk without support, to get up from a sitting position, and to climb steps. Therefore, these latter behaviors which also had zero occurrence rates on the recorded observations, determined the phases of the experimental training program.

Walking Training. The principle objective of the walking program was to effect changes in the topography of S's walking behavior such that he would acquire sufficient control and balance to be able to walk independently of any supporting agent and without excessive unsteadiness.

Since S's walking behavior was fully dependent on the use of some agent that offered physical support, the general purpose of one of the procedures was to gradually withdraw support which was provided initially. This procedure is closely related to *fading*, a programming term used to refer to "the gradual withdrawal of stimulus support", (Holland, 1960).

The fading procedure used for training walking without support involved a gradual withdrawal of the amount of *physical support* a stimulus offered for a motor response rather than a systematic fading of the visual or auditory cues offered by the stimuli used in other types of training that have utilized fading techniques.(Bijou, In press).

A series of supportive stimuli was developed which ranged along a continuum from highly supportive (in terms of the physical properties of the stimulus, primarily rigidity and steadiness) to functionally non-supportive along the physical dimension. The stimuli used were: E's hand, E's finger, a round wooden stick 3/4 in. in diameter, a slightly flexible round wooden stick 1/4 in. in diameter, a very flexible spring about 1/2 in. in diameter, a piece of clothesline rope, taut at first then gradually slackened, and finally a piece of thin string. The last step involved was the terminal goal of walking without support.

Each of the stimuli, except for E's hand and finger, was about two to three feet in length. The length of these objects made it possible for E to gradually move farther away from S, who was holding the opposite end, while still holding the stick, spring, or rope. By moving her grasp farther away from the point at which S was holding the object, E's control over the steadiness of the support was decreased. The elements involved in support were thus faded along three dimensions: the rigidity of the object itself, the steadiness of the object, and the proximity of E's grasp to S's (which also moved E farther from S).

When S entered the room he was taken to the center of the room (while holding E's hand) and given whatever supportive stimulus he was currently using. E suggested that she and S walk across the room to one of the toy corners. As they were walking, E delivered the edibles directly from her apron pocket into S's mouth following any changes in S's behavior. At times E instructed S to walk straight ahead or to lift his feet higher. If S complied, reinforcers were delivered. When S held E's hand or the stick very loosely or did not bear down with much of his weight on the hand or stick, he was also given a piece of candy. Once he arrived at the corner, he was allowed to play with the toy for a few seconds.

After six sessions of about fifteen minutes each, S had moved from holding E's hand, to her finger, and then to the larger stick which E now held about 18" from S's hand. A new procedure was introduced into the session along with the fading procedure (Meyerson, et al., 1967). Although S's progress had been satisfactory under the initial procedures, the new technique was introduced to see if the combination of procedures would speed acquisition of independent walking behavior. Two chairs were placed back to back, 24" apart. S was place between the chairs with both hands on the back of one chair. E stood in front of the other chair and said, "S, come over here." S turned, placed one hand on the back of the opposite chair in front of E, then the other hand, and was give a bit of candy. E then stood in front of the other chair and repeated the procedure, each time moving the chairs slightly farther apart. By the end of the first session with this technique, the chairs were approximately 42" apart, a little beyond S's arm span, thus requiring at least one unsupported step.

In the next session, the chairs were placed 36" apart and by the end of th session were 56" apart, thus requiring about 3 or 4 small unsupported steps. In the third session of this condition the chairs were placed 48" apart and were extended to 78"; requiring about 5 or 6 small steps.

After only seven sessions S had begun taking steps without support in various other settings, as indicated from the recorded generalization observations. He was consequently coming into contact with a greater variety of reinforcers over longer periods of time than the short experimental sessions three times a week. It was decided that a reversal should be attempted within the experimental sessions before the behavior was no longer under the control of the stimuli in the experimental setting. The independent walking response was rapidly becoming very strong and the possibility of obtaining a reversal within the experimental and probe sessions was questionable. Nevertheless, a reversa was attempted.

The basic design for the reversal was essentially the same as that for the training sessions with only the contingencies reversed. Scooting behavior was reinforced [illegible] small edibles and toys in these sessions. The toys were removed from the corners and a variety of small toys were placed in E's pocket. S was taken to the center of the bare room and allowed to walk around freely. E then sat down on the floor and called S. If S came and sat down on the floor, reinforcement was delivered. E then placed a toy on the floor about 5 feet away from S. As S scooted across the floor to the toy, food reinforcers were given and he got to play with the toy. E continued to place toys in various places on the floor and presented reinforcers to S for scooting to the toys. S made no independent attempts to get up and walk around.

After S had experienced reinforcement contingent on scooting for several minutes, E instructed S to come to the shelf and pull himself up to a standing position. This procedure provided S with a chance to experience nonavailability of reinforcers while he was walking. As long as S was walking around the room, E did not attend to him, and he did not obtain any toys to play with.

As soon as S was standing, E would go across the room and put a toy on the floor. If S attempted to walk over and pick up the toy, E would remove it. If, however, S sat down and scooted toward the toy, E would give him an edible as he was scooting and would let him play with the toy for a few seconds.

The reversal procedures were used for three,15-minute sessions, each of which was followed by a filmed probe. After this, two more sessions were held in which the reinforcers were once again contingent on walking. Probes were also recorded following these two sessions.

Getting-up Training. After S began walking independently, the classroom generalization observations revealed that although walking behavior was increasing, scooting behavior was not decreasing. A possible explanation is that S had never learned to get up from a sitting position on the floor without using a table or similar object to pull himself up. Since all the children in the classroom frequently sat on the floor to play, it was necessary to get up from the floor to walk to any other part of the room. S was frequently observed remaining on the floor and scooting to another area or scooting from his place on the floor to the nearest table and pulling himself up.

The basic reinforcement technique which seemed to have been a critical variable in developing the independent walking response was also used to shape this response, though the specific training procedures differed from those in the walking program. The sudden development of this new response, following application of reinforcement procedures similar to those of the walking program, points to the use of differential reinforcement as critical for shaping the independent walking response.

The total response of getting up without support was broken down into several small components. During the training sessions, E sat on the floor next to S and modeled the first response component of placing the legs straight in front. The model was preceded by the verbal statement, "S, do this." If S imitated E's model, a bit of candy was presented. All components were demonstrated and responded to in this manner until the entire chain of responses involved in getting up had been modelled and imitated. Briefly, the total chain consisted of sitting on floor with legs stretched out in front; shifting weight to one side or hip; pulling knees toward body while leaning to weighted side; putting arm from unweighted side across body on floor; lifting all weight to kneeling position with hands on floor; each foot placed on floor individually while supported by hands on floor; straightening back to standing position.

The training for "getting up" was carried out during steps training. The simple "getting up" sequence was used as a break from the step-training. The entire sequence for getting up was repeated a total of ten times over six step-training sessions. During the initial phases it was necessary to administer some physical assistance which was gradually decreased. The final three sequences were executed with no physical assistance.

Step-Climbing Training. Once the independent walking response was firmly established, the basic reinforcement and fading procedures used in the walking program were applied to train walking up and down steps without support. Rather than continuing to attempt a reversal of the walking behavior it was decided to use the same procedures which shaped walking to shape a second response with a zero operant level. If these same procedures resulted in increasing the rate of this second behavior then procedural efficacy would be demonstrated.

In the step training two different fading procedures were used: 1) gradual withdrawal of the physical support of the same supportive objects as used for training walking, and 2) gradual increases in the height and number of steps on which S was being trained. The criterion behavior was for S to walk up and down three, 4" steps without using any person or object for support.

A special set of steps was constructed consisting of two wooden boxes, each of three sizes, 20" X 52" X 2", 20" X 86" X 2", and 20" X 36" X 2". When all the boxes were in position, they provided three full steps for going up one side and down the other. The boxes could be used in any combination of 2" or 4" steps, thus allowing for gradual increases in both the height and number of steps.

During the first five sessions, only one box was used, providing one 2" step up and one 2" step down. A table filled with a variety of small toys was placed near the foot of the steps which S walked down. E began the first session by placing S on the platform and helping him step down, using her hand for support. The step down gained access to the toys on the table for S. He was permitted to play with one toy for a few seconds and to carry it over to a shelf about two feet away and put it down. The stepping down with E's help was repeated several times before S was taken to the other end of the platform and assisted in stepping up. He received an edible for this response. Once having stepped up onto the platform, S walked across and stepped down, again gaining access to a toy from the table.

Support was gradually shifted from E's hand to the larger stick, and to less supportive objects over the five sessions. During the fifth session, S held one end of the clothesline rope and E the other. The rope was held taut initially and was gradually slackened until there was no physical support afforded by the rope. However, when E attempted to let go of her end of the rope, S offered much resistance. To eliminate the visual stimulus of the rope, E tied the rope around S's waist and held one end behind his back. E kept her hand on the rope and put slight pressure on S's back after assuring him she would hold him in back. It was then possible to gradually decrease the pressure stimulus on S's back until E was no longer touching either S or the rope but simply keeping her hand behind S's back. The effectiveness of this procedure indicated its possible efficacy for future use during entire training sequences of this type.

Once S was walking up and down without any support, a question arose as to whether the next step in training should be to increase the step from 2" to 4" or to add a second 2" step up and down while leaving the bottom step at 2". It was decided to try one 4" step. After a few sessions, S's increased hesitation, resistance, and lack of adequate muscular control of his knees indicated that this was possibly not the better course of action. Combinations of increased step height and increased number of steps were tried, but S made very little progress, particularly in stepping down.

It was observed that: 1) S did not look at the step before putting his foot down, thus often overstepping the edge of the lower step and losing balance; 2) The original balance S gained had regressed; and 3) The knee of the leg remaining on the higher step as the other foot was lowered to the next step was not bending. Thus three procedures were instituted to handle these difficulties: 1) Pictures were taped to the steps and S was told to "Step on the dog" (or whatever was represented in the picture); 2) E reverted to giving S a stick to hold onto for balance; and 3) E pushed S's knee from the back as he began to step down. Physical assistance for knee bending was gradually decreased as S began bending his knee and thus increasing the muscular control he had over weight shift. Then the supportive agent was gradually removed.

At this point, S began attending the summer session at the Kansas Univ. Pre-School, and his private sessions were discontinued in favor of working with him intermittently within the classroom setting at the Pre-School. The steps (three 2" steps without pictures) were placed in an open area of the room, accessible to all the children. S did not approach the steps at all until asked to do so by E. After S had completed the sequence several times, following E's requests and had received edibles and toys, two of the children who often played with S were asked by E to help S learn to walk on the steps. The children were shown how to get S started and where to stand as S was walking on the steps. As soon as S had completed the sequence, the child would give S an edible and subsequently receive one for himself from E. The children had S going up, over, and down the steps as many as 20 times in a 75-minute period. Once walking over the 2" steps was fairly well established, the bottom step was increased to 4" height. A few days later, the middle step was also increased. On the last two days of school, the top step was raised to a height of 4" making all three steps now 4" high. These conditions represented the original criterion response and matched those of the probe tests. No reversal of the stair-climbing behavior was attempted.

RESULTS

The conceptualization presented in Fig. 1, was not intended to predict or present the results of this study, but rather to depict, prior to the implementation of experimental procedures, the possible points at which each behavior might begin to show changes as a function of the planned procedures. As can be noted, the procedural sequence presented in the conceptualization is not the same as that actually followed in the training sessions. For example, the point at which Getting-Up Training appears on this graph is not in accord with the actual procedures of the study since Getting-Up Training occurred following the initiation of step climbing (but during its training) and not before.

Figures 2, 4, 5, 6, and 7 are depicting response generalization to the preschool setting, i.e., walking with and without support, sitting, scooting, standing with and without support, and getting up with and without support respectively. Figures 2, 4, 5, and 6 represent a percentage of total recorded intervals for any one observation day rather than percentage of total time. It should be remembered in reading these graphs that the dependent variables were counted in the number of 15" intervals in which a particular behavior was emitted at least once. Therefore, it is possible for all the behaviors being observed to be recorded in any one 15" interval, regardless of their mutual exclusiveness. The days of observation recording were not continuous but rather intermittent since S attended the preschool only two days a week.

At the time of this writing the final data on step climbing have not been completely analyzed. The films and data from Step Climbing Training are not yet available. This particular response is also not recorded in the generalization graphs because it was not possible to present comparative data on this behavior due to the infrequent opportunities for S to emit step climbing behavior in the preschool setting.

Walking Training Results

Walking without support did not immediately generalize to the preschool environment following the onset of a few independent walking steps in the training sessions. However, once the unsupported walking response was emitted in the daily environment, the rate of this response increased rapidly beyond that of supported walking. Unsupported walking never again decreased to a point below supported walking, even though the latter never decreased to the zero operant level. This non-elimination of supported walking could be partially due to the "natural" behavior of three-year-olds of holding someone's hand when walking to a specified point or when going outside. The combined behaviors, walking with and without support, increased across observation sessions, which indicates not only an increase in walking without support, but also a general increase in total time spent walking.

Figure 3 shows the probe tests carried out during the walking program that were introduced to measure behavior during the reversal procedure. Nine probes are graphed, four of which were immediately preceeding reversal, three during and two immediately following the reversal procedures. Probe 5 of the reversal period reflects a tendency toward a reversal of trends of the two behaviors, walking with and without support. Probe 6 does, in fact, represent a complete reversal of the trends. However, Probe 7, which is still under reversal conditions shows that it is, in fact, quite difficult to consistently reverse this type of behavior. Once reinforcement was reinstated for walking the behavior increased rapidly.

As would be expected, scooting (Fig. 5) decreased in almost direct proportion to the increase in the rate of walking behavior. Also, the scooting slope decelerates more rapidly across time than did the walking with support (Fig.2).

Sitting (Fig.4) did not decrease with the same rapidity as walking increased. However, there was a continuous deceleration over time. Because walking would not be expected to replace sitting as it would scooting, and because sitting would be expected to occur at about equal frequency to walking and standing in the usual preschool settings, this slow but steady decline was not at all surprising. There is a sharp decline in sitting which corresponds to a sharp rise in walking without support during the four observations recorded at the last preschool setting. This preschool setting in which S was observed at the time of these abrupt changes afforded more opportunities to walk and stand and less to sit than had the two previous environmental settings.

Fig. 6 indicates that standing without support showed slight increases shortly after the onset of Walking Training, but did not increase sharply until much later. On the other hand, the slope representing standing with support indicates only limited decreases and this behavior never reached the near zero operant level. These were the behaviors which were being observed to determine what effects, if any, would be shown upon their rates as a result of the training procedures and the modification of other different but related behaviors. It was reported by the observers that S tended to lean against tables, chairs, etc., while he was standing. Such a tendency wouls result in a graphic presentation which shows little change over time. When the frequencies of standing with support and standing without support are totaled, it is quite apparent that S is:, in fact standing more often as opposed to sitting.

Getting-Up Training Results

The results subsequent to Getting-Up Training (Fig. 7) indicate that S learned rapidly to get up without support, a previously zero operant level behavior. The mutually exclusive behavior, getting up with support, exchanged places with this training behavior in decreasing to a zero operant level. These data, when compared with the other generalization data, for days 12 through 22, show little effects on other behavior, including standing with and without support. One exception to this is that when getting up with support increased scooting behavior (Fig. 5) finally decreased to the zero baseline level. The observers reported that during observations for days 12 through 16, S's scooting behavior also depicted a qualitative change which was not reflected in the quantitative graphs. Apparently the only time S was scooting were times when he was sitting on the floor and would scoot to a table or chair in order to pull himself up to a standing position. Therefore this behavior was qualitatively different from the scooting responses previously used almost constantly for transportation.

In Fig. 8 the actual data collected in the study is presented in a multiple baseline schema. This figure when compared with Fig. 1 indicates that in general the actual data follows the anticipated increases and decreases of specific behaviors that were planned at the start of the study.

Insert Fig. 8 about here

DISCUSSION

The use of a multiple baseline design for those behaviors that are judged to be difficult to reverse was demonstrated in this study. Although a reversal procedure was attempted it appeared that it was not stable.

When using this design an initial and complete selection of behavior categories to be observed throughout the entire study should be stressed. This is also true for sub-divisions of observed major behaviors. For example, if the observation procedure had allowed for a breakdown of standing with support such that it could differ between social holding contact with people and holding on or being supported by inanimate objects then further information would have been realized from this study. Although it is impossible to pre-guess all categori that may be desirable to observe, careful attention prior to the implementation of the study in this area must be given.

Besides serving as a demonstration for a multiple baseline design, this study also serves as an example of the types of procedures that can be used in shaping walking, getting up without support and step climbing. There was nc attempt to test or stress one procedure as being more definitive in obtaining the desired response than another. The guiding approach in all training was the use of shaping procedures. By starting with a response S could emit and slowly re inforcing closer approximations to the terminal response it was possible to modify the behavior, maintain a motivational system, and avoid resistence behaviors. Only when the shaping procedures moved too quickly did progress break down. The use of fading E's prompts was also an important procedure used concurrently with shaping. Final conclusions cannot be stated until an analysis of the data on step-climbing is completed.

FOOTNOTES

[1] The research reported herein was partially supported through a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C. 20506. The opinions expressed herein are those of the authors and should not be construed as representing the opinions or policy of any agency of the United States Givernment.

[2] Now at Webster College, Webster Groves, Missouri.

[3] The authors wish to thank Mrs. Aleta Cooper, Head Teacher, the University of Kansas Infant Study Center; Mrs. Beatrice Lott, Nurse, University of Kansas Preschool Laboratory; Miss Margaret Cooper, Head Teacher, Preschool Laboratory and our subject's parents for their help and excellent cooperation during the course of the study.

[4] The reliability for all behaviors was consistently above 90% for all observers. The authors wish to thank Mrs. Libbly Ralston, Mrs. Cathy Silver and Mrs. Bonnie Flemming for their help with the collection of the observation data.

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Figure Captions

Figure 1	A schematic of the multiple baseline design of this study prior to implementation.
Figure 2	Percent of 15 second intervals of walking with support and walking without support across three preschool settings: before and after walking training.
Figure 3	Percentage of steps taken and scoots of combined total movements during pre-reversal, reversal, and post-reversal phases.
Figure 4	Percent of 15 second intervals of sitting across three preschool settings: before and after walking training.
Figure 5	Percent of 15 second intervals of scooting across three preschool settings: before and after walking training.
Figure 6	Percent of 15 second intervals of standing with support and standing without support across three preschool settings: before and after walking training.
Figure 7	Number of responses per day of getting up with support and getting up without support before and after training.
Figure 8	Results of the multiple baseline design: percent of 15 second intervals of sitting, scooting, walking, standing without support on left ordinate; and number of responses per day of getting-up without support on the right ordinate.
Table 1	Response categories and scoring symbols used in observing S in the three preschool settings.

Table 1 -- Response categories and scoring symbols used in observing S in the three preschool settings.

SYMBOL	RESPONSE	DEFINITION
S	Sitting	Sitting down in chair or on floor or large toy for at least 3 seconds.
C	Scooting	Moving about while in sitting positions on floor by pulling self with legs and arms, making at least 2 complete pulling movements to be counted as C.
O	Standing with support	Standing on both feet while holding onto or leaning against some supportive environmental object, maintaining this position for at least 3 seconds.
Ø	Standing without Support	Standing on both feet without holding onto or leaning against any supportive agent, maintaining this position for at least three seconds.
/	Walking with support	Taking at least 2 steps, i.e., picking up each foot at least once and putting it down in a place other than the one from which it was picked up, all while holding onto some supportive object or person.
X	Walking without Support	Taking at least two steps totally without the support of any object or person.
H	Being Held, picked up, or lying on the floor	These diverse observations were all grouped under the symbol H because they did not have any specific relevance to the behaviors under study and also because they rarely constituted more than one per cent of a single day's observations since they occurred so infrequently.
P	Getting up from sitting position on floor with support	Reaching up to top of chair, low table, or shelf and pulling rest of body up mainly through strength of arms.
P/	Getting up from sitting position on floor without support	Getting to standing position without the use of any other object in the environment usually by turning over onto knees, then to feet, then lifting rest of body to upright position.

Fig.1-Conceptual Diagram of Multiple Baseline Design of this Study Prior to Implementation

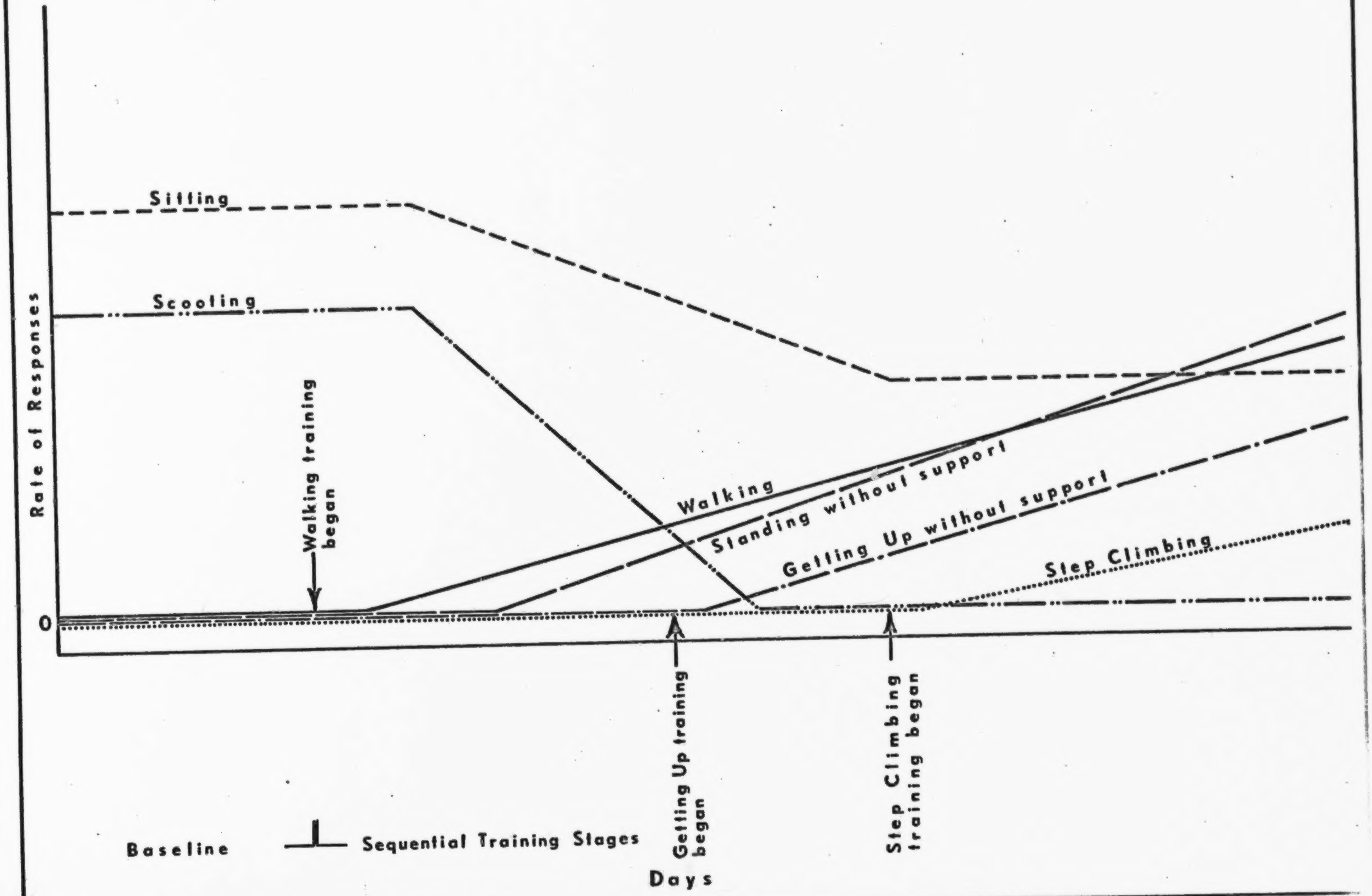


Fig.2 -Walking With and Without Support

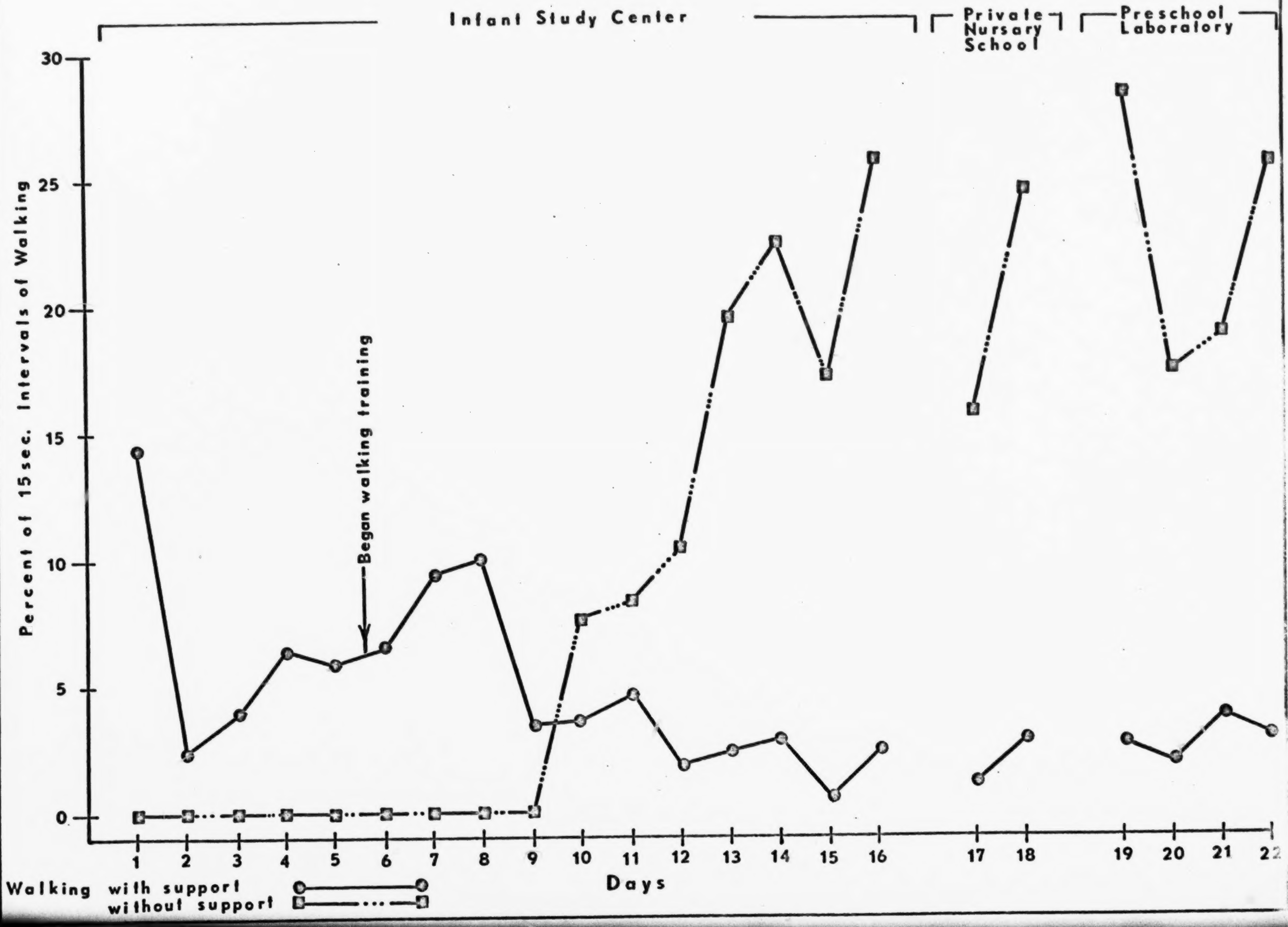


Fig. 3

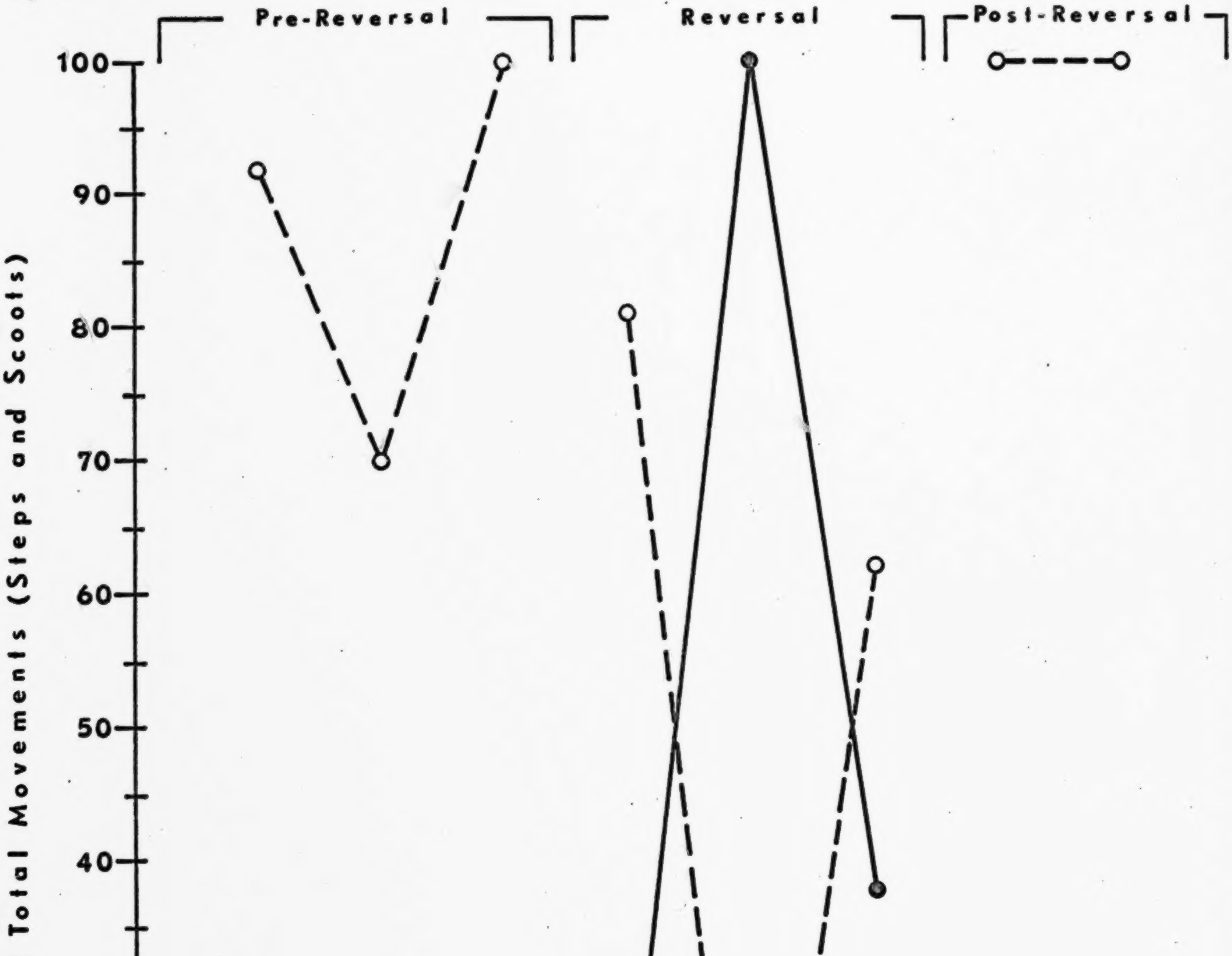

Pre-Reversal
Reversal
Post-Reversal
Percentage of Combined Total Movements (Steps and Scoots)
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
Probes
Steps taken
Scoots

Fig.4 -Sitting

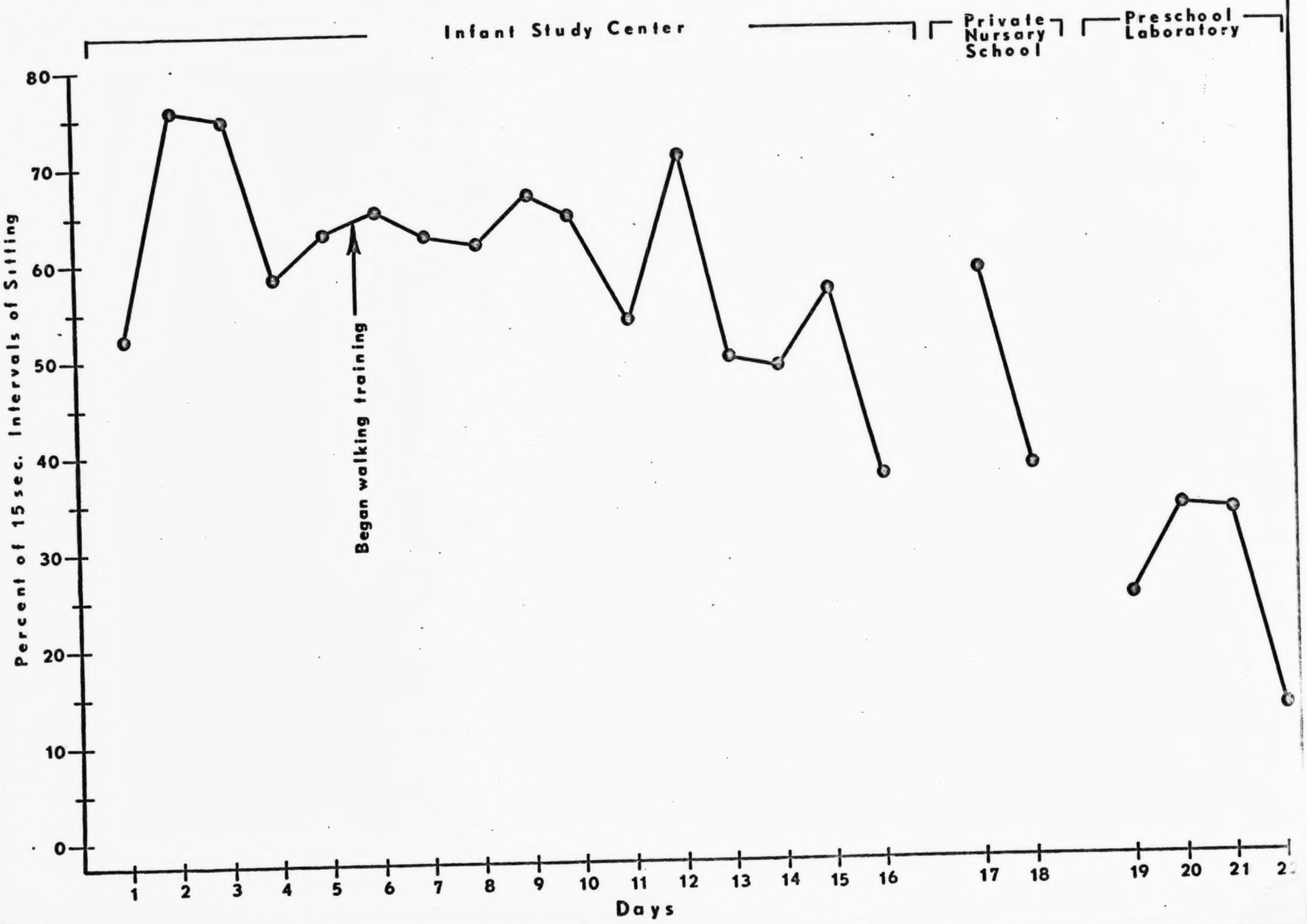


Fig.5 Scooting

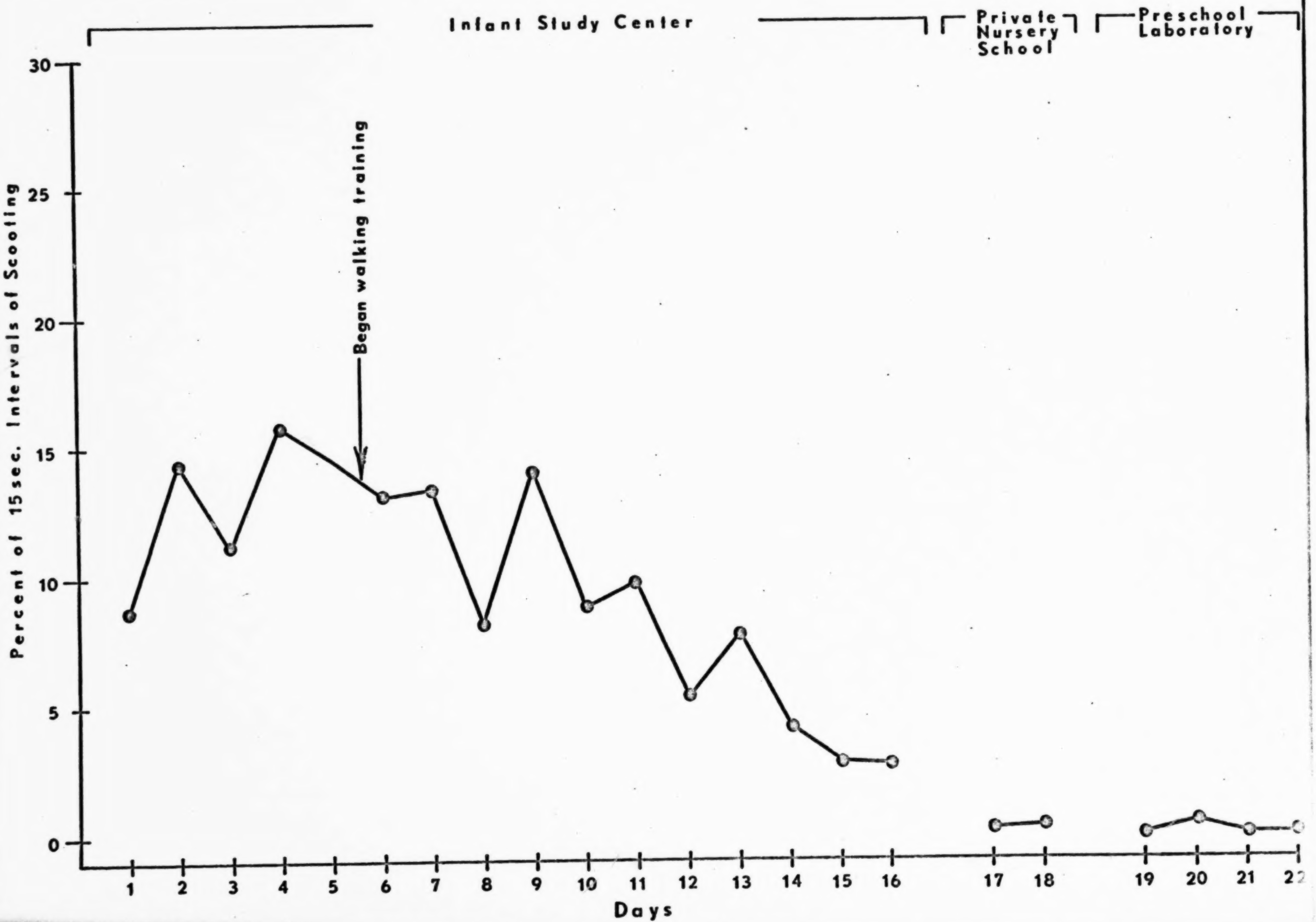


Fig.6 - Standing With and Without Support

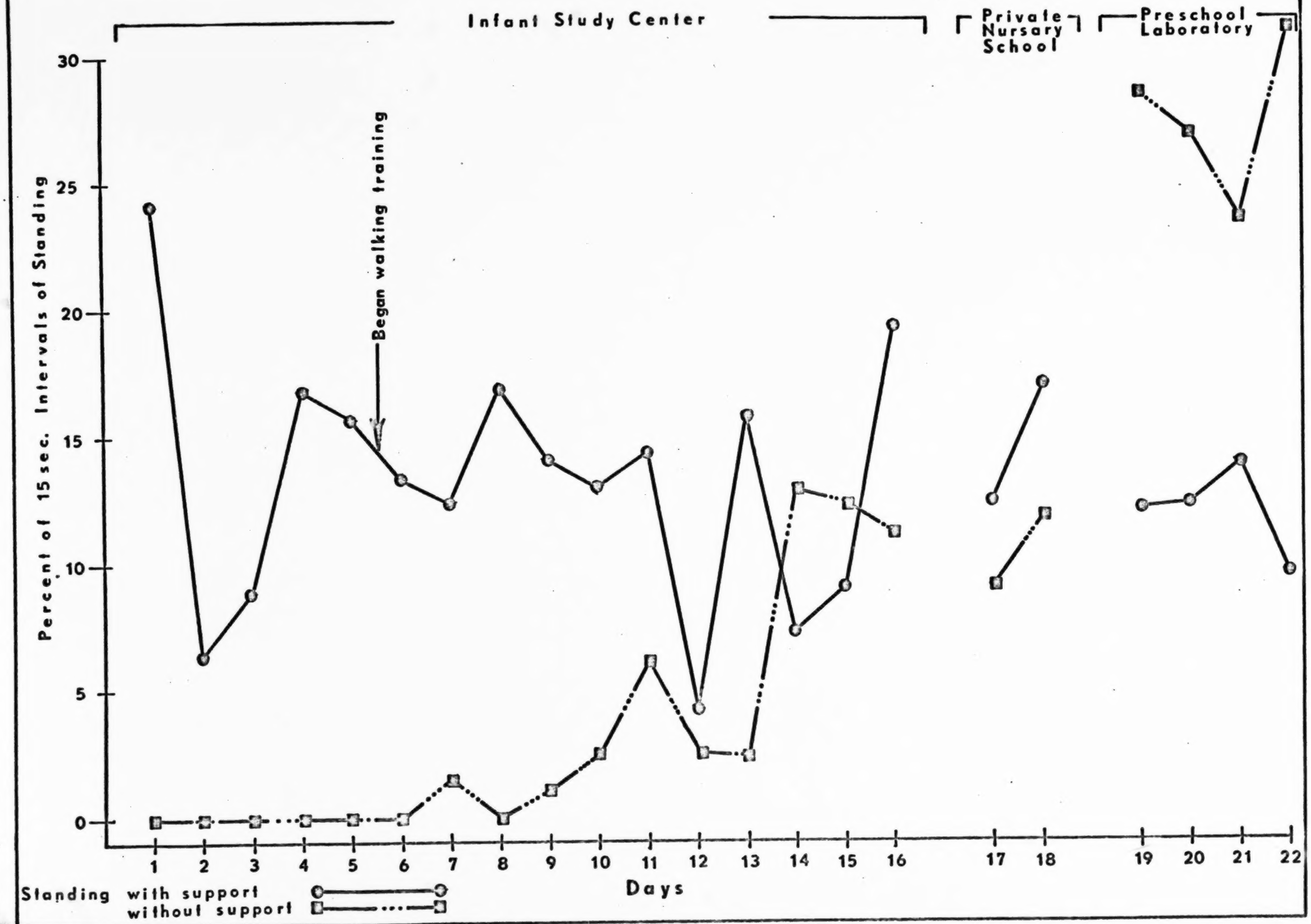


Fig.7 -Getting Up From Floor With and Without Support

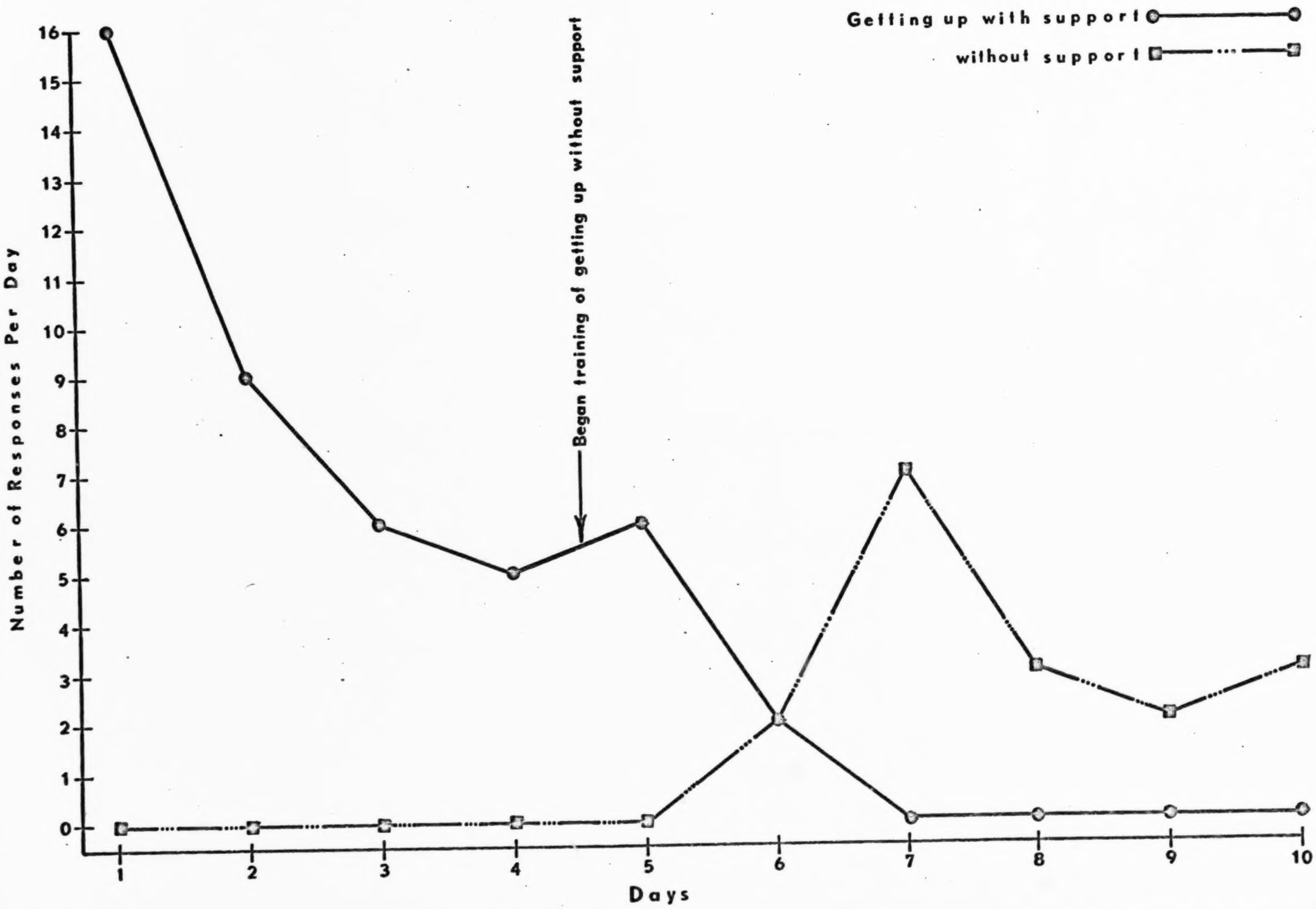
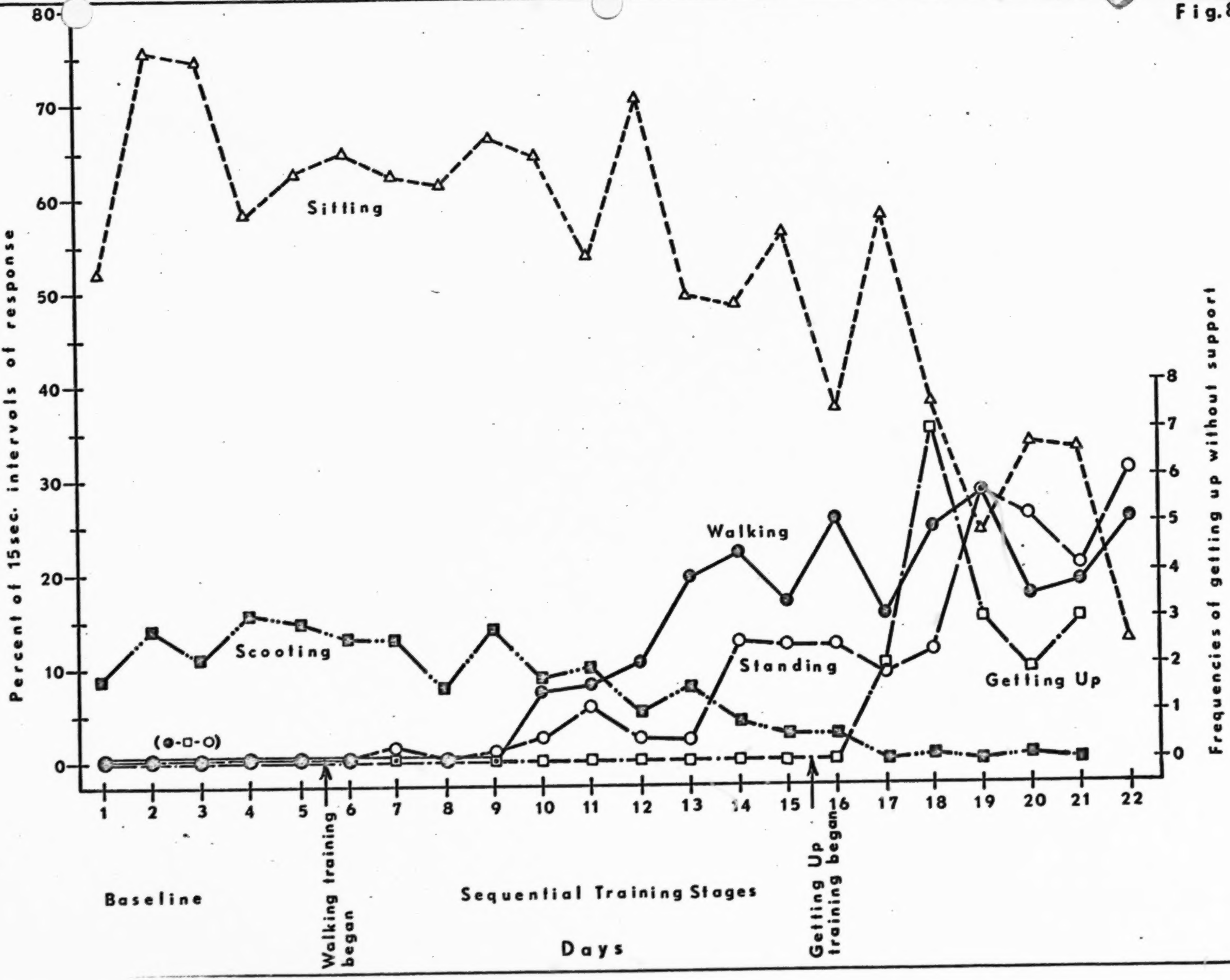


Fig.8


Percent of 15sec. intervals of response
80
70
60
50
40
30
20
10
0
Frequencies of getting up without support
8
7
6
5
4
3
2
1
0
Sitting
Scooting
Walking
Standing
Getting Up
(●-□-○)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
Baseline
Walking training began
Sequential Training Stages
Getting Up training began
Days

Programming Motor Responses of Auditory and Visual Rhythm Stimuli

Barbara C. Etzel, Ph.D.

Department of Human Development

University of Kansas Head Start Evaluation & Research Center

NOTE: This study is not being included at this time. A supplemental report will be submitted covering the results when analysis is completed.

The University of Kansas Head Start Research and Evaluation Center

VIII.

"Physical Development of Children in the Head Start Program in the Central United States."

William Bass, Ph.D.

Marie Cross, Ph.D.

Department of Anthropology

Department of Human Development

The University of Kansas Head Start Research and Evaluation Center

VIII A

"Anthropometric Measurements of Children in the Head Start Program."

William M. Bass, Ph.D.

Department of Anthropology
Department of Human Development

ANTHROPOMETRIC MEASUREMENTS OF CHILDREN IN THE HEAD START PROGRAM

William M. Bass and M. Scott Ferris
Department of Anthropology
University of Kansas

In conjunction with the Head Start Progran of the University of Kansas Head Start Evaluation and Research Center, and anthropometric measurement study was made of a group of children in the program. Permanent personnel of the Head Start Program were trained by Dr. William Bass to take the necessary measurements and observations. Of prime interest were patterns of tooth eruption, and basic head and body dimensions were taken on each child.

The study sample consisted of a group of 148 individuals, all school children; there were 76 males and 72 females with a total age range of 4 years, 4 months to 6 years, 7 months. All were Caucasian, though ethnic origin was not determined. They were residents of Missoula, Montana, Lincoln and Omaha, Nebraska. The children were examined once except for a control group used to check measurements, which was measured twice.

At the examination, every child was measured by a trained anthropometrist, according to a fixed schedule involving general body, head and face dimensions, as well as dental observations. The measurements included the following:

Head length - from glabella to opisthocranion
Head Breadth - from euyon to euryon
Total facial width - bizygomatic breadth from zygion to zygion
Total facial height - nasion to gnathion

Body dimensions were taken with an anthropometer on the left side with the subject's shoes removed. The measurements included;

Weight
Height
Acromial height - from the most lateral projection of the acromion of the scapula to the floor.
Stylion height - from the distolateral end of the styloid process of the radius to the floor.
Dactylion III height - from the middle of the tip of the middle finger when the fingers are removed from contact with the thigh and are pointing perpendicularly downwards to the floor.
Suprasternal height - from the middle of the anterior-superior border of the manubrium sterni to the floor.
Symphyseal height - form the middle of the anterior-superior border of the symphysis pubis to the floor.

The dental examination was specifically designed to note the eruption sequence of the deciduous and permanent dentition. Conditions noted were:

Deciduous tooth present.
Adult tooth present.
Not fully erupted adult tooth.
Deciduous tooth has been lost and not yet replaced by adult tooth.

The following observations were made in regard to dental eruption patterns in the children studied:

In the age range 4 years to 4 years 12 months, both males and females showed a consistent absence of the first permanent molar (6-year molar).

In the age range 5 years to 5 years 12 months (the largest group of subjects), the females showed the largest number of erupted 6-year molars and both central and lateral incisors.

Also evident were the loss of deciduous teeth in the females. The males lagged in both of these categories.

In the age range 6 years to 6 years 12 months, the males showed an increased incidence of erupted 6 year molars and incisors, equaling the rate of the females in the same age range.

In this preliminary report, it should be made clear that due to the small and restricted sample a limited amount of data is available. In the final report a more complete and detailed analysis of the existing data will be presented.

The University of Kansas Head Start Research and Evaluation Center

VIII B

A Nutritional Survey of Children in Head Start Centers in the Central United States

Marie Cross, Ph.D.

Department of Antropology

Department of Human Development

A Nutritional Survey of Children in Head Start Centers in the Central United States

Marie Z. Cross, Ph.D.
Department of Human Development

Abstract

This study was undertaken to evaluate the effectiveness of using a questionnaire to evaluate the nutritional status of children in head start centers in rural, small city and metropolitan areas in central United States. Since parents usually speak more freely about food likes and dislikes of their children than about actual quantities of food consumed, we used this approach to obtain knowledge of foods which the children were familiar with and liked. The only quantitative data that we attempted to obtain was with respect to the quantities of milk consumed daily.

In addition to the questionnaire data, we obtained and analyzed one weeks menus from each of the head start centers involved in this study to determine their contribution to the nutritional status of these children.

The data obtained from the questionnaires are of questionable value as quanities of food consumed is concerned, but theses data do give some indication of the foods which these children would prefer to eat.

The nutritional analysis of the Head Start center menus indicated that the centers which we studied were providing adequate amounts and varieties of food for children of this age.

There were no significant differences in the food preferences of the children in the three different areas studied nor in the types of food served in the centers in these areas.

A Nutritional Survey of Children in Head Start Centers in Central United States[1]

Marie Z. Cross

Introduction

This study was undertaken to evaluate the effectiveness of using a questionnaire to evaluate the nutritional status of children in Head Start centers in rural, small city and metropolitan areas in central United States. Evaluation of nutritional status on the basis of data obtained from questionnaires is hazardous at best and doing this without having a nutritionist obtain the history made it even more difficult. Since parents usually speak more freely about food likes and dislikes of their children than about actual quantities of food consumed, we used this approach to obtain knowledge of foods which the children were familiar with and liked. The only quantitative data that we attempted to obtain was with respect to the quantities of milk consumed daily.

In addition to the questionnaire data, we obtained and analyzed one week's menus from each of the Head Start centers involved in this study to determine their contribution to the nutritional status of these children.

Procedure

A nutritional questionnaire was answered by the mother of each of the 154 children that were included in this study. The research team members were instructed in the manner in which the questionnaire should be used and in ways to establish rapport with the parent during the interview. The questionnaire (see Figure 1) was designed to determine the children's food likes, dislikes and preferences. It was our purpose to see if this approach might result in our obtaining an accurate and honest answer to questions involving quantities of food consumed by the child. In this particular study the only quantity asked for was the amount of milk consumed.

Insert Figure 1 here

The questionnaire data was analyzed according to the type of area the children lived in namely, rural, small city or metropolitan area.

The breakfast or lunch and snack menus were obtained from each center for the week of April 10th through April 14th. These menus were analyzed for nutrient content assuming average pre-school age servings. The Agricultural Handbook No. 8 entitled Composition of Foods, and published by the United States Department of Agriculture was used as the source for determining the nutrient content of the menus. The entire five day food intake was analyzed and the total values were divided by five to get a value for an average daily intake of each of the nutrients. Using the National Research Council's recommended daily allowances as a standard we calculated the percentage of the child's daily nutritional needs which were supplied by the Head Start center's lunch program.

Results and Discussion

Table 1. summarizes the data obtained from the questionnaires. The results are expressed as percentages of children who liked certain of the nutritionally important foods and in the case of milk, those who received adequate amounts each day. The high percentage of children who were reported to receive three or more glasses of milk per day led us to suspect that the mothers may have given the answer they thought they should give rather than an honest value for the amount of milk comsumed by their child.

Insert Table 1 here

In most cases where a child was reported to like meat, fish or poultry he liked all three but if a preference was cited it was most frequently chicken. In the fruit group bananas, apples and oranges were most frequently cited as preferences with oranges occurring less frequently than the other two.

The questions relating to vegetables preferences indicated carrots as the most frequently liked raw vegetables. In the cooked vegetable group potatoes, green beans and corn were cited most often as [illegible] favorites.

If the children received their preferred foods frequently it would indicate that their nutritional needs were being met quite well. The foods most frequently reported as favorites are foods which are valuable sources of nutrients needed by children of pre-school age.

There were no significant differences in preferences of foods between children in a small city, rural or metropolitan area. As Table 1 shows most mothers felt their children recieved enough food but some of them indicated it was not always the right food.

About one-half of the children's favorite snacks would be classified as nutritious including such foods as milk, fruit and cheese while the other one-half preferred sweet snacks such as cookies and candy. The reported consumption of candy by these children was quite high with the children from the rural area consuming slightly less candy than those in the small city or metropolitan area.

Table 2 shows the amounts of the different essential nutrients provided by the lunch programs in the Head Start centers in the three areas studied. In addition this table shows the percent of the total day's nutritional needs for the 3-6 year old that was provided by the school lunch program. The three areas differed in the type of meal and or snacks offered which in turn effected the type and amount of food served and hence the amounts of certain nutrients supplied. The children in the rural area received only lunch while those in the small city area received lunch plus a snack. In the metropolitan area the children received breakfast and a snack. In spite of these differences, all of the children received at least one-third of their day's requirements of all but one of the nutrients and in most cases over one-half of their nutritional needs. In some cases the daily requirements were exceeded due to certain foods being included in the diet which were exceptionally high in those nutrients.

Insert Table 2 here

The data in Table 2 can be used only as a general indication of what the children actually received since we do not know the actual amounts of foods which were served and we don't know how much each individual child ate. However, these data do indicate that the Head Start centers which were studied were providing meals which gave generous amounts of the nutrients needed by children in this age group. This should provide good nutritional training for these children and hopefully some of this experience and training would be carried to their homes.

Conclusions

The data obtained from the questionnaires are of questionable value as far as quanties of food consumed is concerned, but these data do give some indication of the foods which these children would prefer to eat.

The nutritional analysis of the Head Start center menus indicated that the centers which we studied were providing adequate amounts and varieties of food for children of this age.

There were no signifiaant differences in the food preferences of the children in the three different areas studied nor in the types of food served in the centers in these areas.

FOOTNOTES

The research reported herein was performed pursuant to a contract with the office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinions or policy of any agency of the United States Government.

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Table 1.

Summary of questionnaire data from the three areas studied

	Small City	Rural	Metropolitan
Total No. of children studied	46	51	57
Percent of children receiving 3 or more glasses of milk daily.	80.4	82.3	89.5
Percent of children who liked meat, fish, or poultry.	84.8	90.0	87.7
Percent of children who liked fruit.	100.0	96.0	96.5
Percent of children who liked vegetables.	84.8	92.1	66.6
Percent of mothers who reported their children ate enough.	91.3	78.4	77.0
Percent of children who ate candy frequently.	75.0	78.5	64.0

Table 2.

Evaluation of the menus from the Head Start Centers in the three areas studied.

	Small City (lunch & snack)		Rural (lunch only)		Metropolitan (breakfast & snack)	
Nutrient	Am't per day	% of day's requirement supplied	Am't per day	% of day's requirement supplied	Am't per day	% of day's requirement supplied
Calories	677	42.3	769.0	47.6	604.0	37.6
Protein(gms.)	31.3	78.2	33.0	82.5	17.3	43.2
Calcium(mgs.)	665.0	83.0	382.0	47.7	359.0	44.9
Iron(mgs.)	3.6	36.0	4.4	44.0	3.2	32.0
Vit. A(IU's)	2767.	110.0	3274.0	131.0	1322.0	52.8
Ascorbic Acid(mgs)	87.6	175.0	44.0	88.0	47.0	94.0
Thiamin(mgs)	.43	71.0	.38	63.3	.34	56.0
Riboflavin(mgs)	.80	80.0	.78	78.0	.58	58.0
Niacin(mgs)	7.46	67.8	5.86	53.2	3.1	28.0

THE UNIVERSITY OF KANSAS HEAD START EVALUATION & RESEARCH CENTER

QUESTIONAIRE
RA-50 Cross-Bass Research Project
(To be carried out following the OEO Parent Interview)
Dr. Marie Cross, Investigator, Dept. Human Development
Dr. William Bass, Department of Anthropology

Does he (she) like milk? ____________________

About how much milk does he drink each day? ____________________

Does he like meat, chicken, or fish? ____________________

Would he rather eat: Baked beans? ____________________
Ham and beans? ____________________
Peanut butter sandwich? ____________________
Maccaroni and cheese? ____________________

Does he like fruit? ____________________

What kind of fresh fruit does he eat most often? ____________________
If not mentioned above, ask:
If he likes and eats: Apples ____________________
Oranges ____________________
Bananas ____________________

How often does he eat canned or dried fruit? ____________________

Does he like vegetables? ____________________
What is his favorite raw vegetable? ____________________
What are his favorite cooked vegetables? ____________________

If not mentioned above, ask:
Does he like? Green peas? ____________________
Green beans? ____________________
Cabbage? ____________________
Potatoes? ____________________

Do you feel the child eats enough? ____________________
Too much? ____________________
Not enough? ____________________

If he snacks between meals, what are his favorite snacks? ____________________
____

Does he eat much candy? ____________________ Does he drink much pop? ____________________
____

CHILD'S NAME ____________________ CHILD'S NO. ____________________

CENTER NAME ____________________ CLASS NO. ____________________

CENTER NO. ____________________

Figure 1

The University of Kansas Head Start Research and Evaluation Center

IX.

"Development of 'Matching' Abstractions in Young Children."

James A. Sherman, Ph.D.

Department of Human Development

Development of Generalized Matching or Mismatching Repertoires in Young Children[1]

James A. Sherman

Department of Human Development

University of Kansas

ABSTRACT

Two children were reinforced for matching or mismatching certain sample stimuli. When reinforcement was delivered contingent upon matching responses to certain sample stimuli, the children showed an increased amount of matching other sample stimuli in the absence of direct reinforcement for these matching responses. When reinforcement was delivered contingent upon mismatching responses to certain sample stimuli, the children showed an amount of mismatching other sample stimuli in the absence of direct reinforcement for these mismatching responses. The results indicate that the procedures employed established generalized repertoires of matching or mismatching responses. The results indicate that the procedures employed established generalized repertoires of matching or mismatching in these children.

Development of Generalized Matching or Mismatching Repertoires in Young Children

INTRODUCTION

An "abstraction" may be defined as the differential responding of a subject under the control of a specific stimulus property of an object or number of objects. For example, light of certain wave length (or within a certain wave length range) reflected from any kind of object may control the verbal response "red". The variety of objects in terms of shape, area, volume, etc. which control this verbal response may be infinitely large, yet each one is responded to as "red". In this example, the abstraction is under the stimulus control of only one characteristic of the object, namely, the wave length of light reflected from it. Other types of abstractions are those formed along a relative dimension between two or more objects. That is, abstractions of "larger than", "smaller than" or "equal to" with respect to the comparative height, width, area, etc. of objects might be established in subjects. The simple type of abstractions cited above are an important aspect of the educational training of most children, since the more complex abstractions which are the heart of educational training are based upon these simple types of abstractions. However, in many children (e.g., the autistic, the retarded and the culturally deprived) these simple abstractions are either not developed or are developed late which inhibits the more complex learning dependant upon simple abstractions.

Important in an analysis of abstractions, is an examination of the effects of previous training upon generalization to other situations. The purpose of this study was to develop a simple relational abstraction of "matching" or "mismatching" in children and to investigate some of the experimental conditions in which this abstraction generalized to situations which were not explicitly involved in the training procedures.

METHOD

Subjects and Apparatus:

The subjects were two children (one male and one female) approximately four years old, who were enrolled in the University of Kansas Preschool. The apparatus was a six-position matching-to-sample device on which were arranged five response buttons in a circle with a single response button in the center. Each response button had a display window immediately above it upon which visual stimuli were displayed. The stimuli used were straight lines which were tilted at various inclinations from vertical (0, 30, 60, and 90 degrees). To the left of the response panel was a chute through which marbles could be delivered into a plastic cup. The presentations of stimuli, the marble delivery and recording of responses were controlled by standard electromechanical programming and recording equipment.

PROCEDURE:

Initial procedure:

Each subject was brought into the experimental room and shown a box with a variety of toys and candy in it. They were told that by working at at the match-to-sample panel they could earn marbles which could be traded for any toy or piece of candy they wanted after the session was over. Then each subject was seated before the match-to-sample panel (upon which a sample stimulus was displayed) and the experimenter demonstrated how the apparatus worked. The experimenter first pressed the center button under the illuminated sample stimulus and produced the choice or match stimuli on the circle of display windows surrounding the sample window. The experimenter then pressed the match button under the stimulus identical (in terms of angle of rotation) to the displayed sample stimulus; a marble was delivered through the chute, and the next sample stimulus was displayed on the center window. The subject was then told to first press the button in the middle and when the choice stimuli were produced on the outside circle, to press the button under the line which was the same as the line in the middle. When the subject went through the response sequence a marble was delivered, the experimenter left and the session began. In subsequent sessions the subject were only given instructions as to how many marbles were required to get a toy or piece of candy.

In all sessions a press to the sample button resulted in the presentation of line stimuli on four of the match display windows, while one match display window remained dark (the sample stimulus remained illuminated). A press to a match button under an illuminated display always resulted in the match display being darkened and the presentation of a new sample stimulus. A press to the match button under the dark display always resulted in a five second period in which all of the displays were dark and responses to any button produced no programmed consequences. The purpose of this "time-out" procedure was to reduce the systematic position preferences that some pilot subjects had displayed. After the time-out period the same stimulus arrangement was presented as that which immediately preceded the time out. Throughout all sessions the sample stimuli and the positions of the match stimuli and dark display window was varied in a random order.

Procedure I : Match or mismatch reinforced:

In sessions one through five, a press to any one of the match buttons under an illuminated stimulus display resulted in the delivery of a marble. This response was reinforced whether the stimulus over the button matched the sample stimulus or not. The purpose of this procedure was to establish a baseline measure of degree of matching accuracy when neither matching nor mismatching was differentially reinforced.

Procedure II: 0, 30, and 90 degree mismatch reinforced; 60 degree probes

In this procedure the subject was reinforced for pressing a choice button under a stimulus display which did not match the sample stimulus. Any mismatch to a 0, 30, 9r 90 degree sample resulted in the delivery of a marble, while a press to the match button under the stimulus which did match the sample stimulus resulted only in the presentation of a new sample stimulus. In sessions six through eight, the 60 degree sample stimulus was not presented, but 60 degree stimuli continued to be presented as possible match stimuli. In sessions nine and ten, the 60 degree sample stimulus was again presented as a sample stimulus, but either a match or mismatch response to the 60 degree sample stimulus resulted only in the presentation of a new sample stimulus.

Procedure III: 0, 30 and 90 degree match reinforced; 60 degree probes

The subjects were reinforced for pressing the match buttons under the stimulus display which matched 0, 30, and 90 degree sample stimuli. Either matches or mismatches to the 60 degree sample stimuli resulted in only the presentation of a new sample stimulus.

RESULTS AND DISCUSSION

Figure 1 and Figure 2 present the proportion of trials the sample stimuli were matched or mismatched for each subject under each of the experimental conditions. During the first procedure of the study in which either matching or mismatching was reinforced, both subjects displayed performances in which the majority of responses to the choice stimuli were to those that matched the sample stimuli, although this degree of matching was quite variable.

Insert Figure 1 and Figure 2 about here

During Procedure II when only mismatching responses were reinforced for the 0, 30 and 90 degree samples, mismatching responses to these stimuli rose markedly. Further when the 60 degree sample probes were inserted, they also were mismatched on the majority of trials. It is important to note two features of these results. First, during procedure II there were no differential contingencies applied to either matching or mismatching the 60 degree sample stimuli. For either type of response the only consequence was to advance to the next sample stimulus. Secondly, during procedure II the extent to which the 60 degree sample stimuli was mismatched was markedly higher than the extent to which it was mismatched during procedure I. In procedure II since there were no differential consequences for mismatching the 60 degree sample stimuli and since the amount of mismatching of this stimulus was considerably higher than in procedure I, it seems likely that the development of mismatching of this stimulus may be attributed to reinforcement of mismatching for the 0, 30, and 90 degree samples. In other terms, an abstraction of mismatching had been developed, such that the 60 degree samples were mismatched even though there were no differential consequences for doing so, as long as mismatches were reinforced for the 0, 30, and 90 degree sample stimuli.

During procedure III the reinforcement contingencies for responses to the 0, 30, and 90 degree sample stimuli were changed, Now only matching responses to these sample stimuli were reinforced, while neither matching nor mismatching was reinforced for the 60 degree sample stimuli. Under these conditions both subjects displayed a sharply increased proportion of matching responses for the 0, 30, and 90 degree sample stimuli. Both subjects also showed an increased proportion of matching responses to the 60 degree sample stimuli during procedure III as compared to procedure II, although, the effect is more clearly pronounced for subject 1 than for subject 2. Again the results indicate the formation of an abstraction (this time of "matching") which produced generalized effects upon matching responses which were not directly reinforced.

The results of this study indicate that a generalized type of matching or mismatching repertoire can be established in children such that whether or not certain sample stimuli are matched or mismatched can be a function of reinforcement for matching or mismatching other stimuli. In terms of the generalized effects upon responses not directly manipulated, these results are similar to those obtained by Baer and Sherman (1964), Lovaas, Berberich, Perloff and Schaeffer (1966) and by Baer, Peterson, and Sherman (1967) dealing with the development of imitative response classes in children.

FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.

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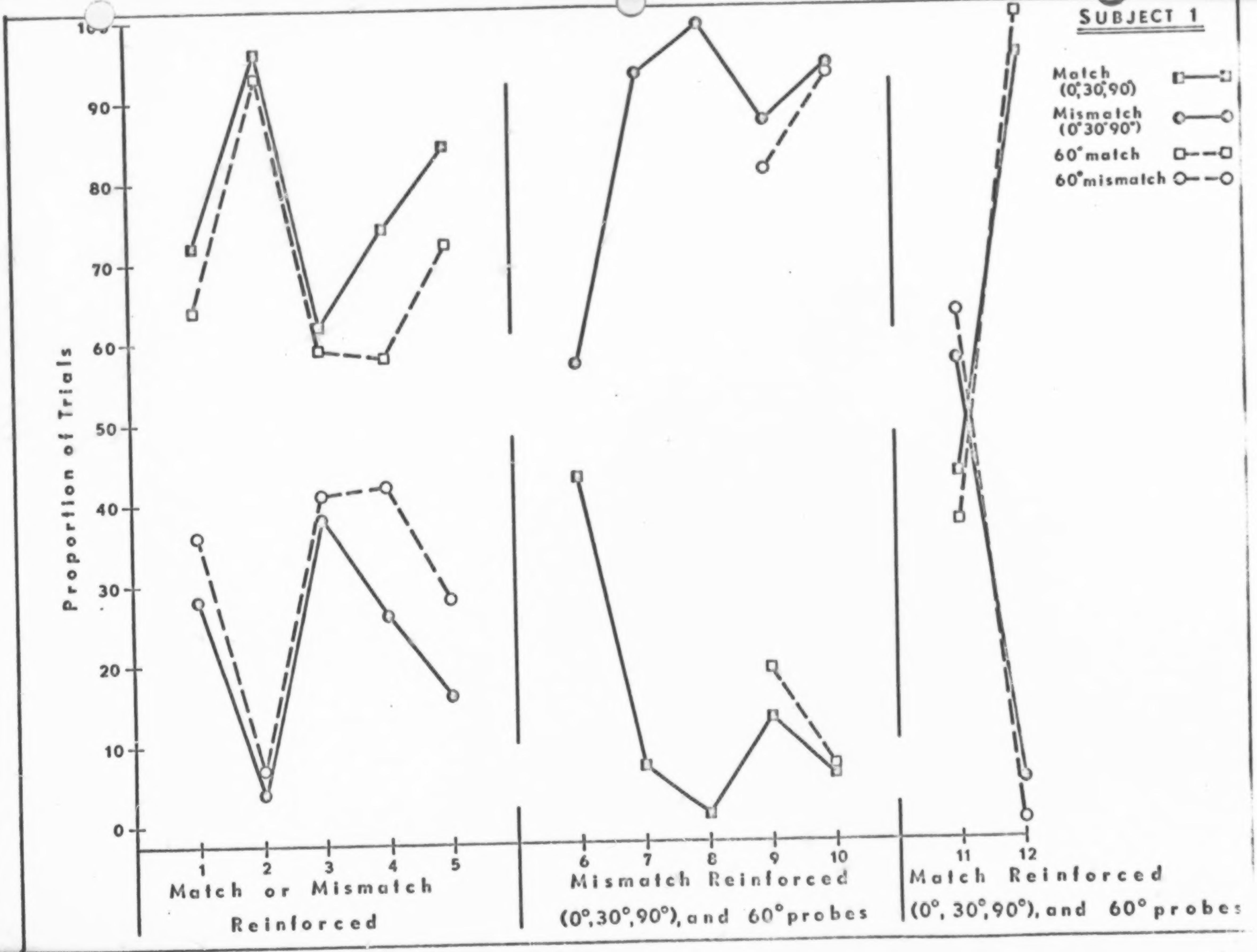
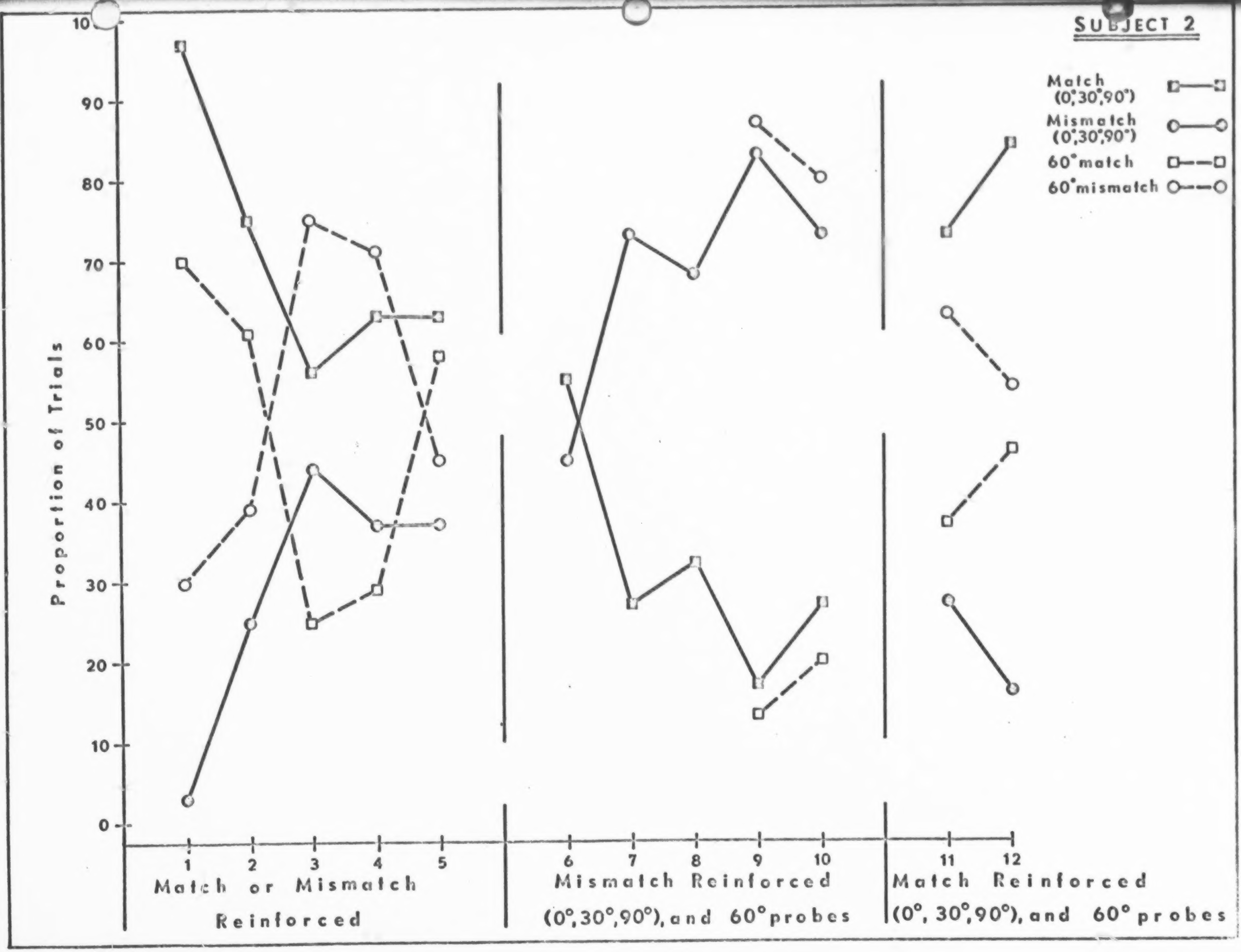

SUBJECT 1
Match (0°,30°,90°)
Mismatch (0°30°90°)
60° match
60° mismatch
Proportion of Trials
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
Match or Mismatch Reinforced
Mismatch Reinforced (0°,30°,90°), and 60° probes
Match Reinforced (0°, 30°,90°), and 60° probes


SUBJECT 2
Match (0°,30°,90°)
Mismatch (0°,30°,90°)
60° match
60° mismatch
Proportion of Trials
10
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
Match or Mismatch Reinforced
Mismatch Reinforced (0°,30°,90°), and 60° probes
Match Reinforced (0°, 30°,90°), and 60° probes

The University of Kansas Head Start Research and Evaluation Center

X.

"Enhancement of the Social Reinforcing Value of a Preschool Teacher."

Lucile Y. Paden, M.A.

Department of Human Development

Enhancement of the Social Reinforcement Effectiveness of a Teacher of Head Start and Middle-Class Preschool Children.[1]

Lucile Y. Paden[2].

Department of Human Development
University of Kansas

ABSTRACT

Running head: Enhancement of the Social Reinforcement. . .

The central purpose of this study was to investigate two methods of enhancing the social reinforcing value of a preschool teacher (1) by associating her social reinforcement with noncontingent tangible reinforcers and (2) by associating her social reinforcement with contingent tangible reinforcers. Ss from both Head Start and Middle-class preschool populations were tested. The design made it possible to compare contingency and noncontingency as reinforcement methods and as treatment of social reinforcement effectiveness. No differences were found between the groups in the amount of inattending behavior observed during a picture naming task under any of the conditions. Contingency and noncontingency both reduced the amount of inattending behavior significantly, and the effect generalized to the tests under social reinforcement. Social reinforcement alone did not significantly reduce the inattending behavior. Examination of individual data reveals an advantage of contingency both as a condition of teaching and as a treatment of social reinforcement effectiveness.

Enhancement of the Social Reinforcement Effectiveness of a Teacher of Head Start and Middle-Class Preschool Children.

Lucile Y. Paden

Department of Human Development
University of Kansas

INTRODUCTION

Teachers of young children typically rely upon social reinforcement to control behavior --- both learning and any other behavior that occurs in the classroom. By social reinforcement is meant any use of gesture, eye contact, smiling, frowning, vocal expression, or ignoring of the child to influence his behavior. Teachers frequently encounter children for whom these procedures appear to be relatively ineffective. Some children seem not to care whether teacher is "happy" or "unhappy" with them. They are uninfluenced by the "good" and the "no". It has been hypothesized that a disporportionate number of such children might belong to the Head Start population.

The reasons for the hypothesis vary from the differences between the cultures from which the child and the teacher come to a failure of the child's environment to associate"social reinforcers" as known by middle class children with tangible reinforcement. Whatever the reason, if the teacher is not able to reinforce a child socially, that child is not in a position to learn from her unless she (1) uses tangible reinforcers, or (2) changes her ability to use social reinforcers with him. The second procedure seems best suited to classroom use.

The teacher's first task is to put the child into contact with the learning situation. That is, to get him to pay attention to it. McCoy and Zigler, (1965) found that grade school children played a relatively uninteresting game longer with a person who had previously provided interesting art materials than with a person who was a stranger, but not as long as with a person who not only provided the art materials but also interacted freely with the child. This suggests that a teacher might enhance her ability to use social reinforcement by temporarily associating herself with tangible materials that are reinforcing.

This study asks the question whether she will be more effective after dispensing tangible reinforcers contingent upon some response of the child or if she will be just as effective if she merely establishes herself as the source of such material, by giving them noncontingently. Both Head Start and Middle Class preschool children were included in the study to investigate whether there were differences between the two populations in response patterns.

A measure of attending behavior was selected as the dependent variable in order to avoid problems associated with differences in intelligence and speed of learning. As it developed, the scores of attending were uniformly high and it was the inattending behaviors of evasion, avoidance and escape that varied.

Procedure

Subjects were eight children, four from a Head Start population and four middle class children from a University Laboratory Preschool, designated as HS and MC. There were three girls and one boy in each group, two whites and two negros in the HS group and three whites and one negro in the MC group. Teachers were asked to suggest children whom they judged to be low in attending to teachers.

A white college student acted as teacher (E) and a white male student recorded the children's responses.

Each child was tested four consecutive days per week for a ten minute teaching session. The task was to name picture cards of animals, birds, insects, and fish.

Responses recorded were, Attention (A), Body Escape (F), Vocal Escape (V), and Crying (C). Responses were recorded at 10 second intervals during each ten minute test period. Attention consisted of looking at the teacher, the materials, or of responding vocally to the task, correctly or incorrectly. As noted above, the scores were uniformly high and were not useful in the analysis. Crying never occured, but Body Escape and Vocal Escape appeared to yield a measure of the child's evasion, avoidance or attempted escape from the task. Body escape consisted of turning away from the cards, repeated body movements, such as leg swinging or getting up from the chair. Vocal escape included talking about something irrelevant, repeating the last correct response, repeating what the teacher said or repeating the same response, such as "I don't know" or "It's a bear." Body escape and vocal escape scores were totaled for the analysis as each child typically used one or the other, almost exclusively.

The experiment lasted five weeks. The first week was a baseline period during which all children were tested daily under social reinforcement. That is the teacher told the child he was doing very well, and gave him appropriate compliments about his successes, first in matching cards then in matching and naming the cards. During the succeeding weeks, the children were given one of three treatments for three days, followed by a test day of social reinforcement. The treatments were Social reinforcement, (S) Contingent tangible reinforcement, (C) and Noncontingent tangible reinforcement, (NC). Social reinforcement was the same as the baseline, that is the teacher behaved just as she had during baseline. Contingent reinforcement condition consisted of giving the child the card to keep when he successfully named it in addition to using social reinforcement as before. That is, social and material reinforcement were being paired in an attempt to enhance the social reinforcement. In the Noncontingent condition, the teacher gave the child a few cards at the start of the session. Contingent children were always tested first and an equal number of cards were given to the Noncontingent children. After he had the cards, the teacher offered to help him learn the names and proceded as under Social reinforcement. In this case, social reinforcement was being paired with receiving the cards as a free gift from the teacher.

The teacher would use one of the three treatments for the first three days of the week. On the fourth day she would not give any cards, but use only social reinforcement. After a three day rest, a new treatment period was begun. Thus, the teacher spent three days establishing herself as the kind of person who reinforces socially, or contingently, or noncontingently. The fourth day was a test of her enhancement as a social reinforcer designated hereafter as S-Soc, NC-Soc, depending upon the treatment preceding the test.

The cards used were available commercially in two sizes. It seemed advisable to use the small "pulpil cards" on tangible reinforcement days and the larger "teacher cards" on social reinforcement days so that the children would not have an expectation of taking home cards and be disappointed. At least one child made the discrimination. On a social reinforcement day he asked when he could play with the little cards again.

The last week consisted of two days of treatment, the social test and a final day of Contingent reinforcement so the children would have cards to take home on the last day.

Results and Discussion

After the first two weeks there was so little difference in attending scores (A) that these were not used. The combined daily F and V scores gave total inattention scores for each child. Scores represent the number of 10 second intervals of inattention during a 10 minute test. Six scores were calculated for each child, the baseline score under social reinforcement (S), which was a mean of the first four days of the experiment; the mean of all the scores under noncontingent reinforcement, (NC); the mean of all scores under contingent reinforcement (C); three means of the test day scores, following social reinforcement treatment (S-Soc), following noncontingent treatment, (NC-Soc) and following contingent treatment (C-Soc).

Means for MC children were lower in every condition than for HS children. However, an analysis of variance (summary, Table 2) indicated that there was no significant difference between the groups, Head Start vs. Middle Class in the inattending behavior that was measured. There was a significant difference, however, in the treatments. A comparison of each test and treatment mean with the baseline score indicated that there was no difference between the baseline and S-Soc scores. That is, social reinforcement alone did not significantly alter the inattending behavior. All other treatments and tests were significantly below baseline, (NC at .05; NC-Soc, C, and C-Soc at .01).

These findings at first appear to be contrary to those of Terrell, Durkin, and Weisley (1959) and Zigler and de Labry, who reported that middle class children perform discrimination and concept-switching tasks more readily under intangible than under tangible reinforcement while lower-class children perform better under tangible reinforcement. Two differences in procedure could account for the children in the present study failing to show significant differences, (1) the use of inattention as the measure instead of learning and (2) the younger age of the subjects.

Inattention as a measure is similar to McCoy and Zigler's length of time playing a game. They did not compare middle class and lower-class children, but did find that use of material reinforcers by the experimenter increased the time spent playing a game by school age children. The present study supports this finding for preschool children.

Terrell, et. al. used an informational light as the intangible reinforcer. The light would not be equivalent to social reinforcement used in the present study.

All three of the above studies used school age children as subjects. It may be that the younger children of middle and lower class respond much alike to social and to tangible reinforcers but that the usual environmental circumstances teach middle class children to increase in responsiveness to social reinforcement as opposed to tangible reinforcement and lower class children to respond in the opposite way. A planned program of intervention by Head Start teachers to associate tangible and social reinforcement could reverse the trend for the lower class children.

A second way of looking at the data is presented in Table 3.

Insert Table 3 about here

In this table, means of the first three days of each week were calculated and listed in sequence with the test scores following each. It can be noted that most of the children improved in that inattention scores were lower at the end of the study than at the beginning. However, there is not a smooth progression for any of the children, indicating that the treatments had differing effects.

To examine the effect of treatment for each child, scores for each treatment (S, NC, and C) and each test (S-Soc, NC-Soc, and C-Soc) were combined. Means of each child's combined scores were plotted along with his partner in the other group who had received the same order of treatments. These graphs appear in Figs. 1 to 4. Pairs A-W and C-Y behaved in a very similar manner. The other children behaved in ways that appear to reflect individual patterns of responding. Group membership, HS or MC, did not correlate with response pattern. There are 23 scores, of a possible 48, (eight children, six conditions) falling below 26 ten-second intervals of inattending behavior. Of these 23 scores, seven fall under C and six under C-Soc. Thus, thirteen of the lowest scores fall under contingency conditions while noncontingency accounts for eight and social alone accounts for two. The score, 26,was arbitrarily chosen for comparison because no scores fall between 26 and 32 so that no near scores were cut off. A similar effect can be seen at other levels.

Insert Figs. 1 to 4 about here

There seems to be little doubt that the use of material reinforcers by a teacher reduces the inattentive behavior, not only during application, but that the effect generalizes to days when the teacher does not use tangible reinforcers. Thus, it appears that a teacher can enhance her effectiveness as a social reinforcer by temporary intermittant use of such simple tangible reinforcers as the picture cards used in this study.

Although the differences failed to reach significance for the group data, there appears to be a slight advantage for contingency both as a treatment for social reinforcing effectiveness and as a method in itself.

Therefore, the implications for teachers would be to pair social reinforcement temporarily with tangible reinforcers for children for whom social reinforcement alone seems to be relatively ineffective. Delivery of the reinforcers contingent upon a desired response from the child has sufficient advantage over noncontingency to make contingency the preferred method. For the children in this study, there were no significant differences between Head Start and Middle Class children, although scores for the MC children were consistently lower than for HS. Viewed with the findings of Terrell et. al. and Zigler and de Labry, the use of contingent tangible reinforcers to enhance social reinforcement seems more important for Head Start children than for Middle Class children as the latter will probably come under social reinforcement control anyway. On the other hand, it is hard to justify leaving such matters to chance for any child.

Figure 1-4

Each child's score under each condition of treatment and test were combined and the means plotted for comparison. Connecting lines are to facilitate comparison and do not imply sequence. See table 3 for sequence of treatment for each pair.

FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.

2. Acknowledgements: The author is indebted to Mrs. Betty Coats, Director of the Community Children's Center and Dr. Barbara Etzel, Director of the University of Kansas Preschool Laboratories for permission to test subjects in those schools. Acknowledgment also is given to Mr. Graeme Blasdel and Mrs. Joan Blasdel.

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Fianl Report on Research
Lucile Y. Paden

TABLE 1

	Soc Baseline		S-Soc		NC		NC-Soc		C		C-Soc	
	M.	SD	M	SD	M	SD	M	SD	M	SD	M	SD
HS	47.35	15.8	46.25	23.8	36.15	17.	30.75	18.	22.5	19.3	21.65	19.7
MC	33.67	29.9	34.67	33.	20.58	19.9	15.65	29.3	14.40	15.6	18.20	23.3

TABLE 2

Summary of Analysis of Variance

Source	df	Ss	MS	F	
I	1	38939.56	3893.56		
Between Ss					
A	1	1519.31	1519.31	2.65	ns
SA′ (error)	6	3427.34	571.22		
Within Ss	5	3924.32	784.86	7.844	.01
b_1 S-Soc	1			.001	ns
b_2 NC	1			5.90	.05
b_3 NC-Soc	1			12.00	.01
b_4 C	1			19.47	.01
b_5 C-Soc	1			16.97	.01
AB	5	222.09	44.42	.44	ns
B′ (error)	30	3001.62	100.05		

TABLE 3

Sequence of treatment means and test scores for pairs of children receiving the same order of treatment.

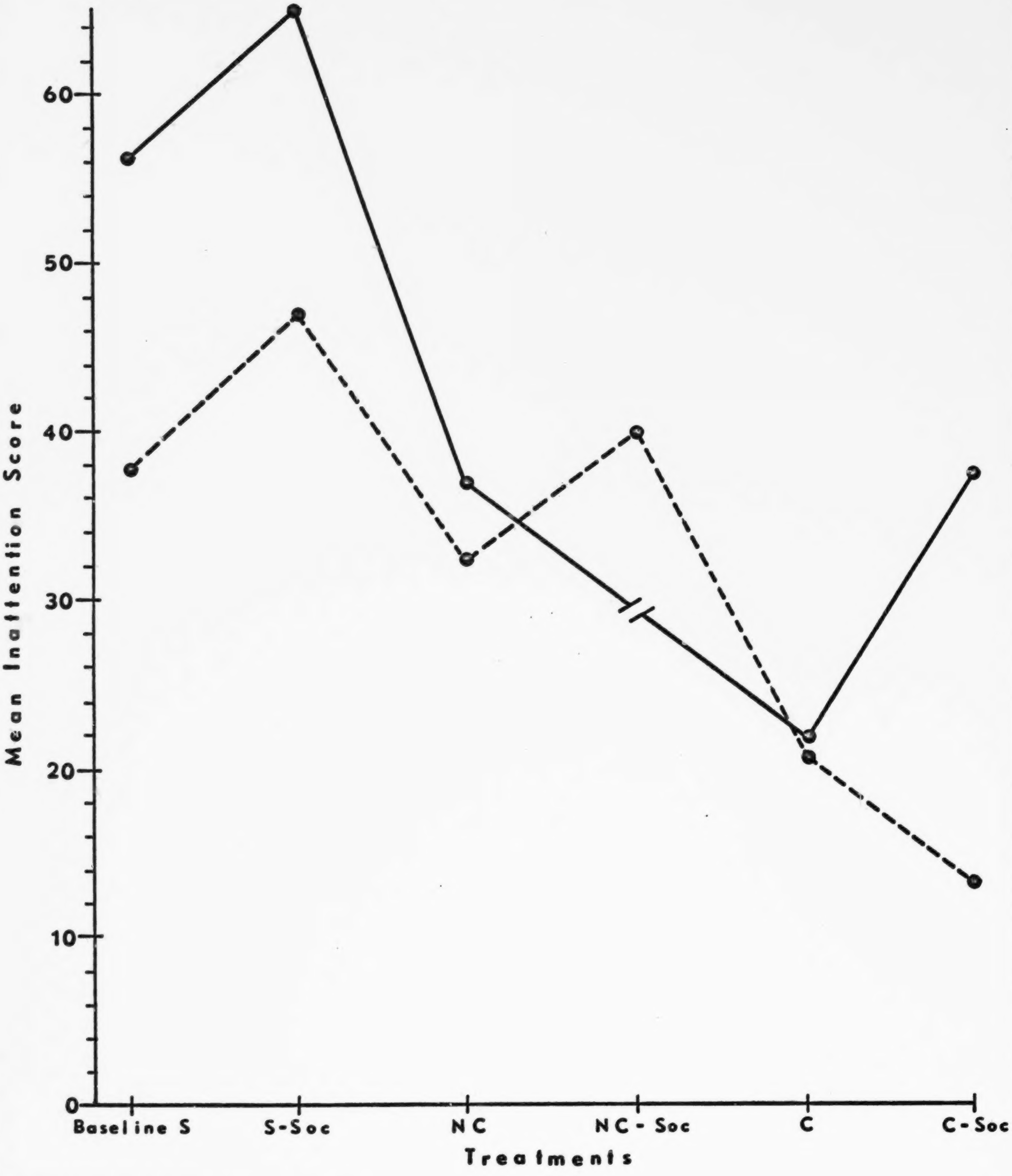
Week		A(HS)	W(MC)
1	S	56.3	52
	S-Soc	47.	56.
2	S	47.3	35.3
	S-Soc	49.	38.
3	C	25.	29.
	C-Soc	20.	21.
4	NC	23.	21.3
	NC-Soc	17.	10.
5	C	17.5	7.
	C-Soc	19.	17.
	C	9.	5.

Week		B(HS)	X(MC)
1	S	37.	37.5
	S-Soc	31.	38.
2	C	29.	27.3
	C-Soc	38.	45.
3	NC	60.6	19.
	NC-Soc	48.	7.
4	C	43.	14.
	C-Soc	19.	32.
5	NC	21.5	18.5
	NC-Soc	38.	16.
	C	No data	19.

Week		C(HS)	Y(MC)
1	S	40.7	10.7
	S-Soc	44.	13.
2	S	28.	9.3
	S-Soc	31.	6.
3	NC	36.	5.5
	NC-Soc	32.	1.
4	C	12.	.3
	C-Soc	7.	2.
5	C	9.	S 1.
	C-Soc	14.	S-Soc 1.
	C	12.	C 0

Week		D(HS)	Z(MC)
1	S	53.3	34.6
	S-Soc	65.	47.
2	NC	37.	32.3
	NC-Soc	55.	40.
3	C	30.	33.7
	C-Soc	No data	19.
4	C	23.3	14.7
	C-Soc	36.	11.
5	C	18.5	15.5
	C-Soc	39.	10.
	C	11.	11.

Means of Treatment and Test Scores for Pair D-Z



Treatment order for pair D-Z

Week 1, S Baseline
2, N
3, C

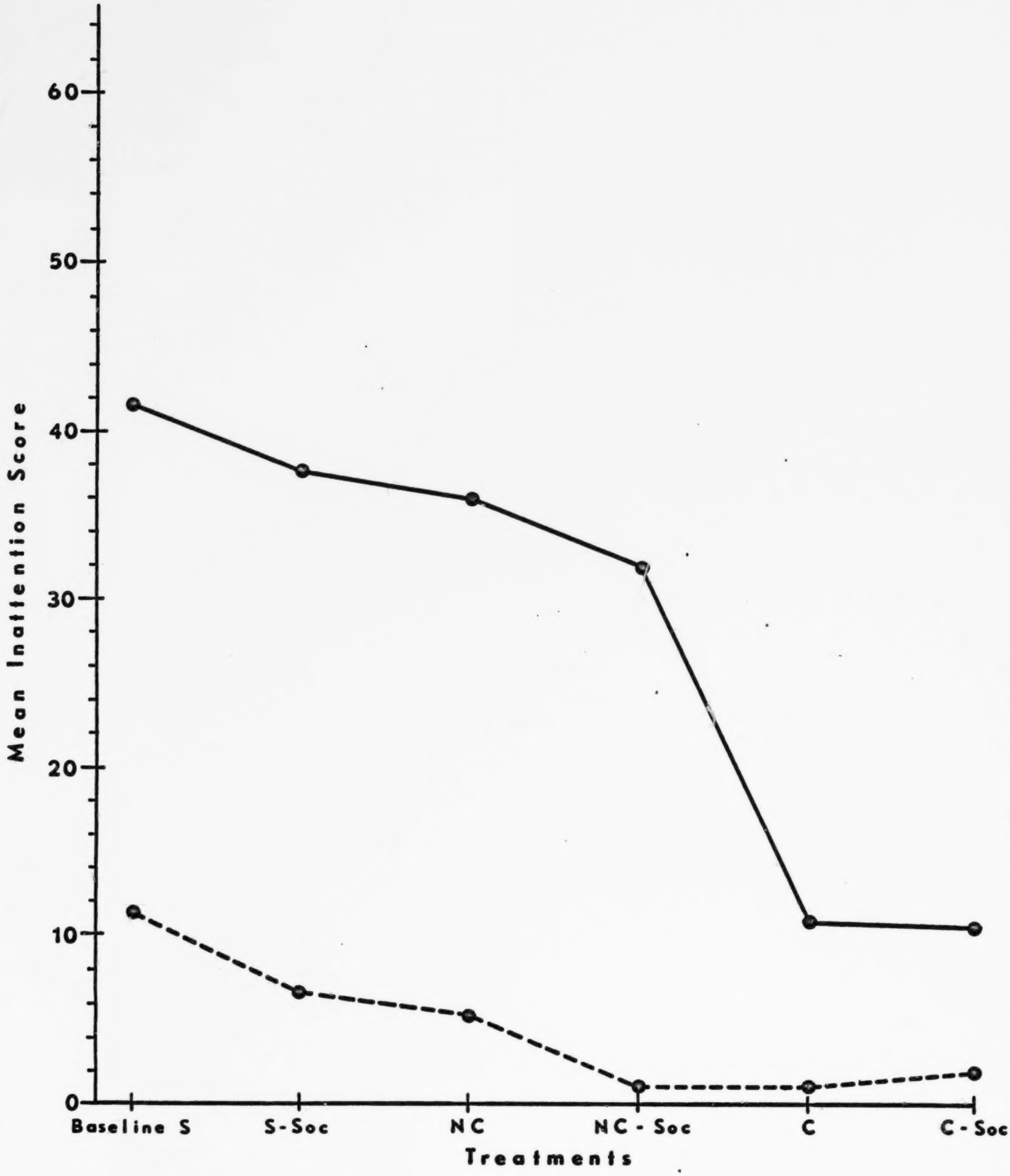
Week 4, N
5, N

(Note, D-HS in NC-Soc: No Data)

D-H S ———

Z-MC - - - -

Means of Treatment and Test Scores for Pair C-Y

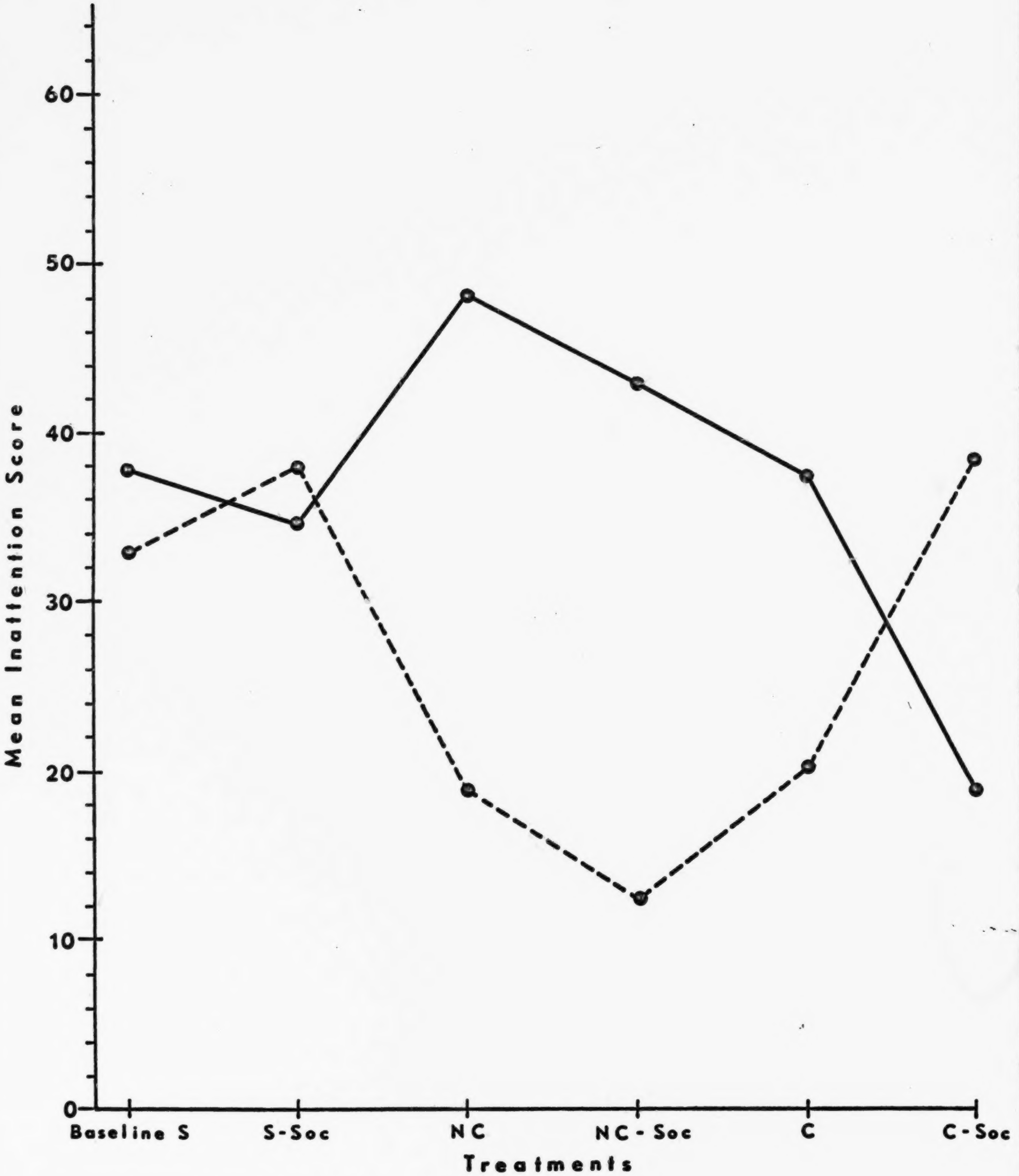


Treatment order for pair C Y

Week 1. S Baseline
2. S
3. N

Week 4. C
5. C for C-HS, S for Y-MC

Means of Treatment and Test Scores for Pair B-X



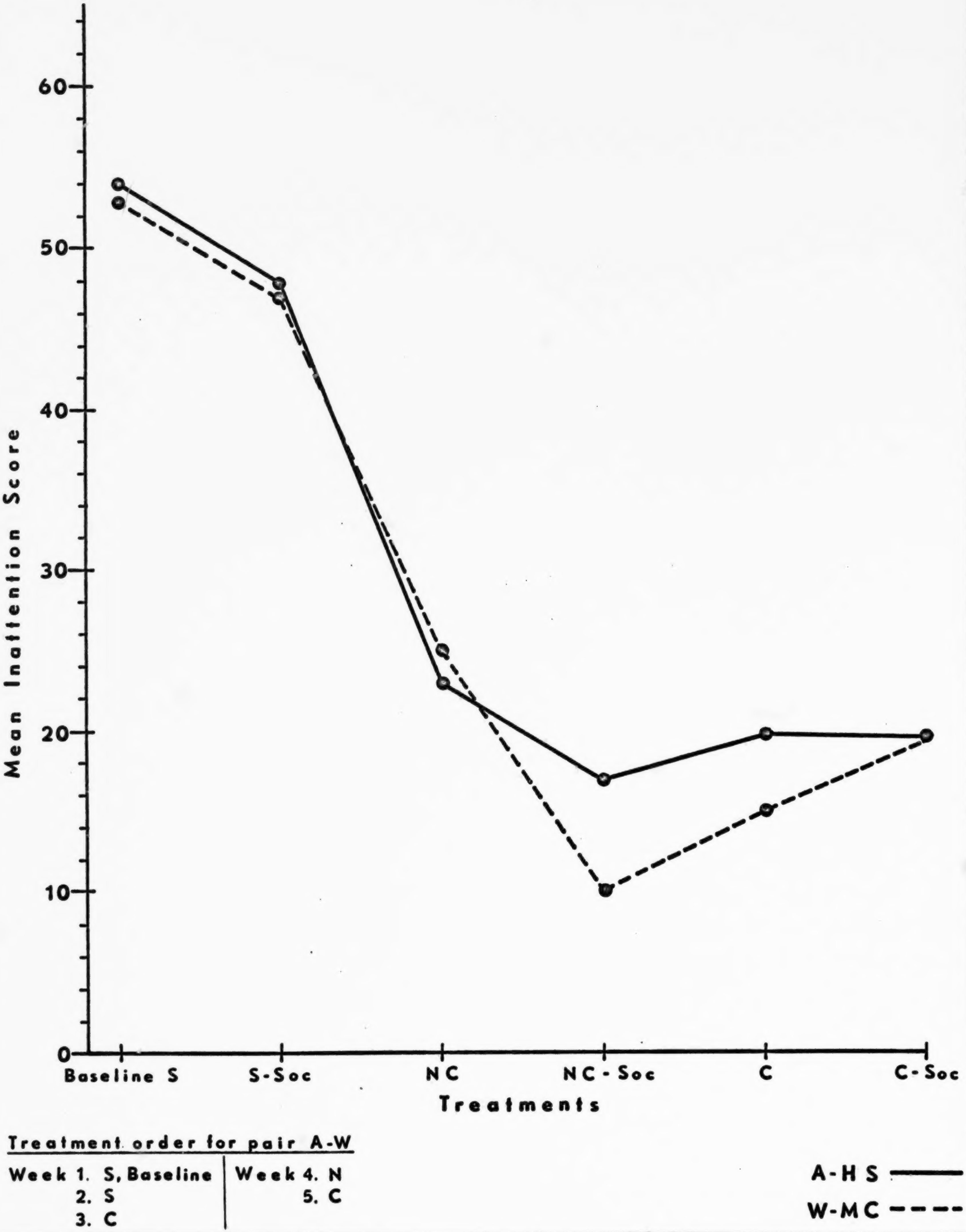
Treatment order for pair B-X

Week 1. S, Baseline
2. C
3. N

Week 4. C
5. N

B-HS ———
X-MC - - - -

Means of Treatment and Test Scores for Pair A-W



Treatment order for pair A-W

Week 1. S, Baseline
2. S
3. C
Week 4. N
5. C

The University of Kansas Head Start Evaluation and Research Center

XI.

"Verbal Recall Research"

Frances Degen Horowitz, Ph.D

Floyd R. Horowitz, Ph.D.

Department of Human Development

Department of English

A STUDY OF RECALL AND ACQUISITION OF LANGUAGE FORMS IN YOUNG CHILDREN[1]

Horowitz, Floyd R., Horowitz, Frances Degen
&
Silverman, Saundra

It is well known that language competence is broadly related to a variety of behaviors generally classified as intellectual. Further, in the variety of sub-cultures present in the United States, there are correlate language systems which to a range of degrees do not facilitate performance in "standard" language settings. With specific reference to the Head Start population it is not clear whether measured language deficits reflect slow acquisition in normal development or the interference of dialect with standard English or both. There are three main concerns proper to the generalized study of acquisition of natural language forms in children. Very little is known about the first--what are the neurophysiological mechanisms that make spoken language possible? In this regard we would wish to know what ontogenetic capacity the child is endowed with, and to what extent that capacity may be shaped by phylogenetic events. As well, it would be useful to differentiate neurophysiologically developmental stages in the child's perception, retention, and generation of language forms. The second main concern is involved with interpolating this as yet uncharted internal complex--according to what continuous system of classifiable logic does the child produce meaningful language forms? In evidence, of course, are his many utterances, from babbling to a one or two word vocabulary by the end of the first year, two or three word juxtapositions and a vocabulary of about two hundred words by the end of the second year, three, four, and five word strings interlacing relatively many language forms by the end of the third year. The ongoing record of such a process, including a description of the child's limitations at any stage, constitutes the third main concern in the study of acquisition of natural language forms.

The controlled research design to be described here relates mainly to this last concern, being in effect a normative and comparative description of childrens' performance over an arbitrarily defined series of verbal language tasks. A pilot study for this present design was done at the University of Minnesota Institute for Child Research and replicated at the University of Kansas Preschool, in each site employing twenty-four children between the ages of 3 years 0 months and 5 years 11 months. At that time it was determined that there was no difference in correct performance length when a child was asked to repeat a string of numbers between one and ten, and when he was asked to repeat a comparably long string of words known to him, put in ungrammatical order. However, children from middle income backgrounds and children from low income backgrounds were differentiated in performance, with children from the low income environments doing more poorly.

Regarding the use of the term "acquisition" there is some discussion in the literature about what valid differences of definition may exist between a child's ability to recall a verbal task when asked to do so, and the related inference that when he can successfully recall a task involving a given form he has in fact acquired that form as part of his language repertory. We have considered this as a moot question, for while it seems to be true that recall and acquisition are somewhat ambivalently defined when the child can successfully repeat a short length string--that is, one or two phonemes long--it is plainly seen that in general he does not have the same success with all strings of the same length. It might therefore be possible to defend the assumption that acquisition is in effect a coding which facilitates the child's recognition of language forms as well as his capacity to reproduce those forms. As will be seen in the developmental arrangement of the data, there is a clear normative difference between the stage at which children can remember tasks of complexities equally well, and the stage at which only certain forms are correctly recalled.

The present study followed the pilot work in modifying and extending the stimuli to test more specifically relative difficulty of certain linguistic forms in both populations.

METHOD

Stimuli

We desired to test whether there were any differences in childrens' ability to repeat five kinds of verbal tasks that we had prejudged as hierarchic in a system of implicit forms. Strings in length from three to seven phonomes were constructed for each kind of task (Figure 1). It was supposed for A_1 strings that the nonsense words would reveal no especial form in their juxtaposition and that the child would perform most poorly in recall of progressively longer strings. It was supposed for A_2 strings that the introduction of a verb into a nonsense string would provide a minimal degree of structuring insofar as the child might have learned that the word before or after such a recognizable word is to be retained with it. It was supposed for B and for C strings that when the child could recognize all the words as ones which he knew, even though they had been juxtaposed to avoid grammatical form as the adult knows it, this might constitute a language form, if only by contrast to the formless sequence of nonsense words, and if only when he had to recall a short string. It was supposed for D strings that simple sentences constituted the next highest order of forms in our hierarchy, though it would have been possible to construct a form between B/C and D strings. It was supposed that some form of transform sentences should be represented by E strings, and that in order to recognize and repeat correctly such a form the child would have to recognize in some way the prior and more extensive form of the transform. Thus, for instance, in the sentence "John fell who fast rode his horse." the child might understand that John was the one who fell when he rode his horse very fast, and might repeat the sentence, as some did, "John fell who rode his orse fast." While on the one hand we were not concerned to write transform rules for the supposed hierarchy of these five kinds of task, on the other hand we assumed that the performance data would reveal if the hierarchy merely was specious. And to avoid juxtaposing words with strong paired associate proclivity of relationship for young children, the Jenkins & Palermo normative word lists of paired associate strength were consulted.

SUBJECTS

Our design called for sixty subjects paired according to sex and selected by the following criteria. Thirty were from middle income homes, the other thirty--classified as Headstart children--from low income homes. Since various claims had been made about the nature and difference of standard language performance between Headstart children and so-called normal children, we thought that among other results these tests might provide a valid measure of comparison. Each group of thirty was further divided into three groups of ten, according to age. In the first subgroup were children from 3 years 0 months to 3 years 4 months; in the second group were children from 4 years 0 months to 4 years 4 months; in the third group were children from 5 years 0 months to 5 years 4 months.

PROCEDURE

The test situation for each child lasted approximately seven minutes. A research assistant was seated opposite the child, explained the tasks as a game in which the child was to listen to the words that the assistant said and then on kinesic cue was to say what the assistant had said. The experimenter also introduced the tape recorder to the child. In the pilot study the child was told he could have a small toy if he played through the entire game, and this technique was especially helpful in keeping the interest of the 3-year-old activists. In the present study, however, we have eschewed this reward, hoping to use it more effectively in subsequent conditioning procedures. Performance of 3-year-olds accordingly was not as consistant as had been the case in the pilot study.

The research assistant tested the subject's ability to understand and perform through a warm-up session over one and two phoneme lengths, given all the kinds of tasks possible through those lengths. Children were disqualified who failed to complete correctly the warm-up, who made no other responses after the warm-up, who exhibited a speech defect, or who were not native speakers of English. Test strings were presented to the children in order of increasing string length. While random order at first had seemed preferable, it was discovered in the pilot study that the younger children were easily discouraged by immediate presentation of the longest strings. Each subject's responses were tape recorded and verified by two listeners, having to qualify at .7 or above. There was better than .9 agreement for many of the 4-year-olds and most of the 5-year-olds. As complete a written record as possible was kept of the child's response utterances and all sessions were tape recorded.

RESULTS AND DISCUSSION

To date, only a general description of the results is available. Data is still being collected from low income three year olds Ss. All data is to be key punched for further computer analysis. Some forms of the response data are given in Figures 1-12. Figures 1-6 indicate total number of words correctly recalled for each kind of stimulus string regardless of position, over each of the lengths from three to seven. Figures 7-12 indicate total number of complete stimuli strings correctly recalled in the order of presentation of their elements, over each of the lengths from three to seven. Because of the nature of the distribution, the data met none of the general assumptions necessary to analysis of variance. Chi square measures also were not applicable because generally the N values were too small to reveal significance. However, both limitations point up what in effect is a strength of the design, that the resultant data reflect the interaction of the five kinds of stimuli tasks and childrens' age with very little variation. Results of the pilot study over an additional forty-eight subjects support this observation.

Insert figures 1-12 here

It can be seen, following the frames of each set, that correct recall of the kinds of stimuli strings generally was a function of increase in age. Most simply expressed, up to a point (for example Figure 12), the 5-year-old remembers more longer and complete language forms than does the 4-year-old, though once past the five phoneme length his performance drops so sharply as to be not much superior to the 3-year-old. Respectively, this trend also characterises the difference in performance between the 4-year-old and the 3-year-old. Consulting Figure 6 it can be seen that while the 5-year-old's acquisition of a seven phoneme complex language form as yet may be inadequate, he correctly can recall approximately 60% of the elements in such a structured string, while in a random word string of like length, (Figure 3), he correctly recalls only 30% of the elements. A related findings is expressed in Figure 1 & 2 where the 5- year- old does not perform as adequately as the 4-year-old or the 3-year-old in recalling a nonsense string. Tentatively this might be explained to record, retain, and generate language information on the basis of certain and not other modes of encoding.

The direction of that acquisition which is shown most clearly in Figure 12 is toward what has been called transform concepts of language forms, that is forms which imply the child's comprehension of related prior forms. If the child does not recognize the stimulus string as having a certain form, (see Figure 10) his recall performance will be lower than if he does recognize such, or part of such a form (see Figure 12). To promote this inference we constructed the C and E strings as permutations of each other. The most dramatic indication of this process is found by comparing Figure 3 with Figure 4, and Figure 9 with Figure 11 where B and D strings were permutations of each other.

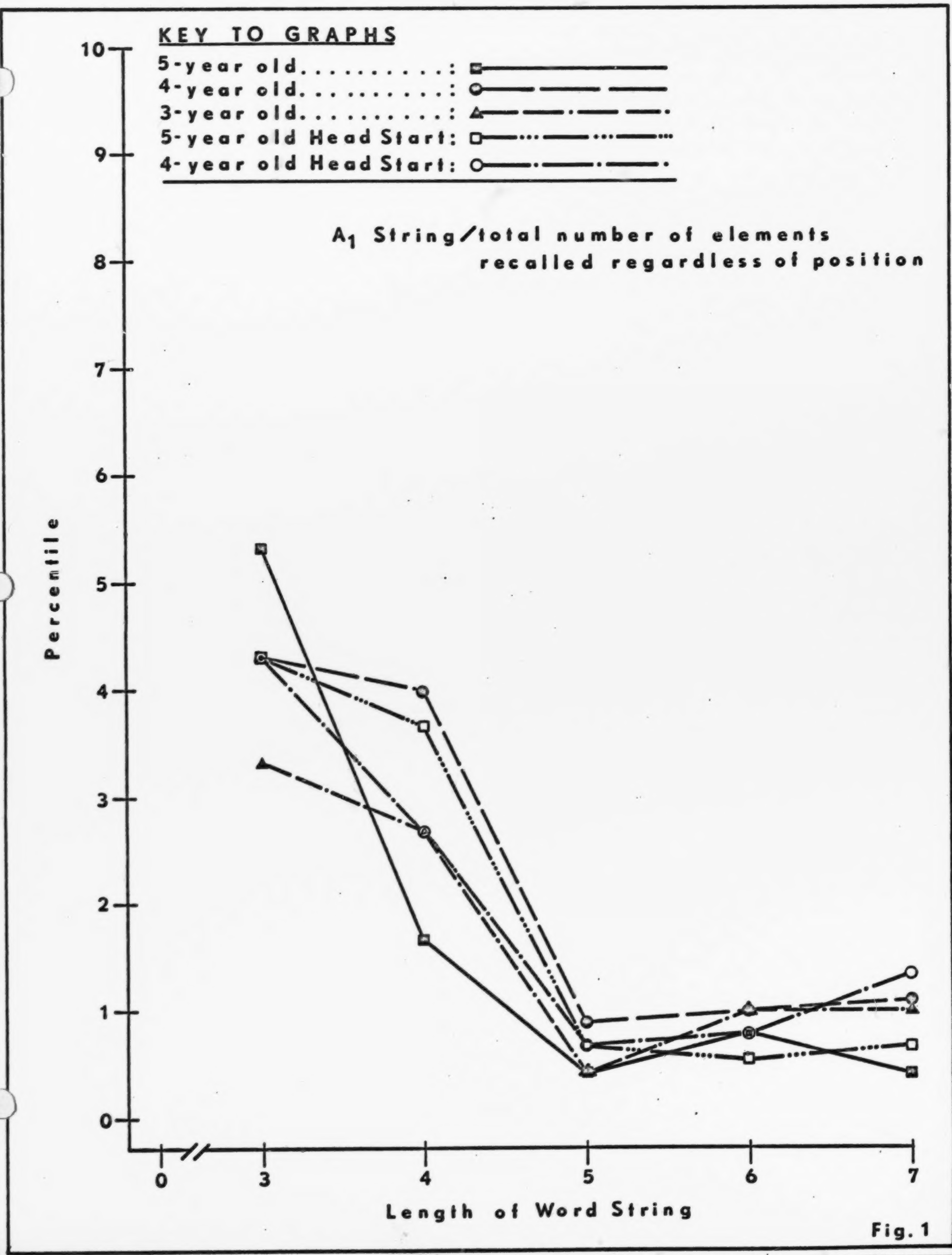
Considering a comparison between the Headstart and the middle income children, these same developmental trends are in evidence, though performance level according to age differs markedly. The 5-year-old Headstart child generally performs like the 4-year-old middle income child, and the 4-year-old Headstart child like the 3-year-old middle income child. Performance of the 3-year-old Headstart cell has not yet been recorded, though we quite naturally will be interested in pursuing the analogy. Also it should be noted, Figures 5 and 11, that as the string length increases for the more complex language forms. 5-year-old Headstart performance drops below the 4-year-old middle income level as well. Because the Headstart childrens' performances in these tasks are not different in order of development from those of the other group, but perhaps only different in rate, we are tempted to think of normative acquisition of language forms for both groups as being shaped and promulgated in the same way--namely by environmental conditioning.

However, this common-sense assumption needs to be explored, and some of its implications tested. For instance, it recommends as possible that the recognition and generation of language forms in the young child greatly can be effected by strengths and kinds of conditioning, and that while certain tendencies of transform construction normatively may be recorded, these tendencies can be altered by other forms of conditioning. Such activity of acquisition, while naturally confined by neurophysiological boundaries, then might be described. Especially now when without evidence and for reasons of logic grammarians have begun to claim that their kernel transforms are nothing less than ontogenetically derived universal forms, there is need for a more qualified appraisal of what variables of experience can effect and do effect the developmental process of language acquisition.

Our further analysis of the present data should yield some interesting information about the nature of the errors that were made. Our further research will proceed to conditioning paradigms and their relationships in language acquisition.

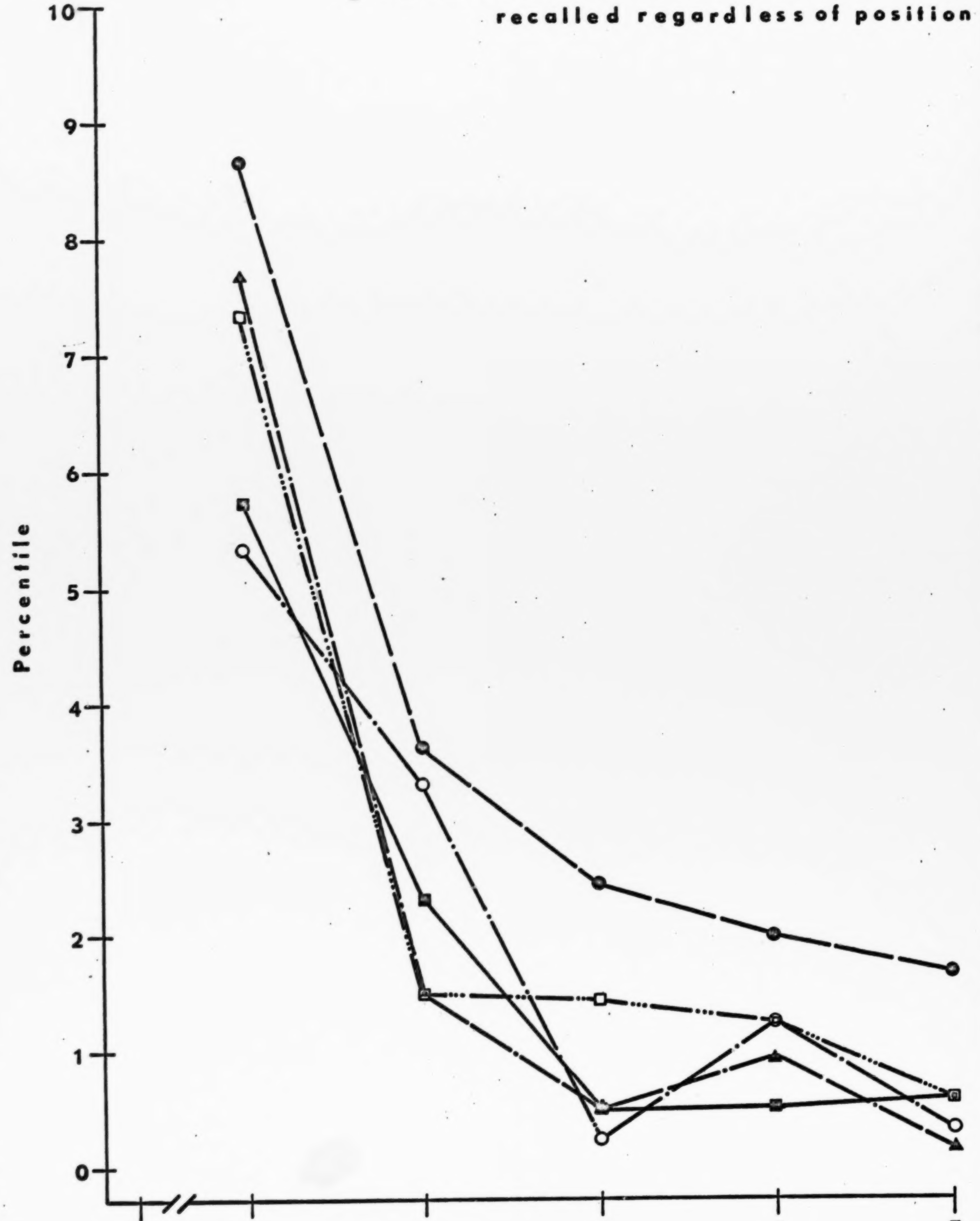
FOOTNOTES

1. The research reported herein was performed pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D.C., 20506. The opinions expressed herein are those of the author and should not be construed as representing the opinion or policy of any agency of the United States Government.



A₁ String/total number of elements recalled regardless of position

Fig. 1



A_2 String/total number of elements recalled regardless of position

Fig. 2

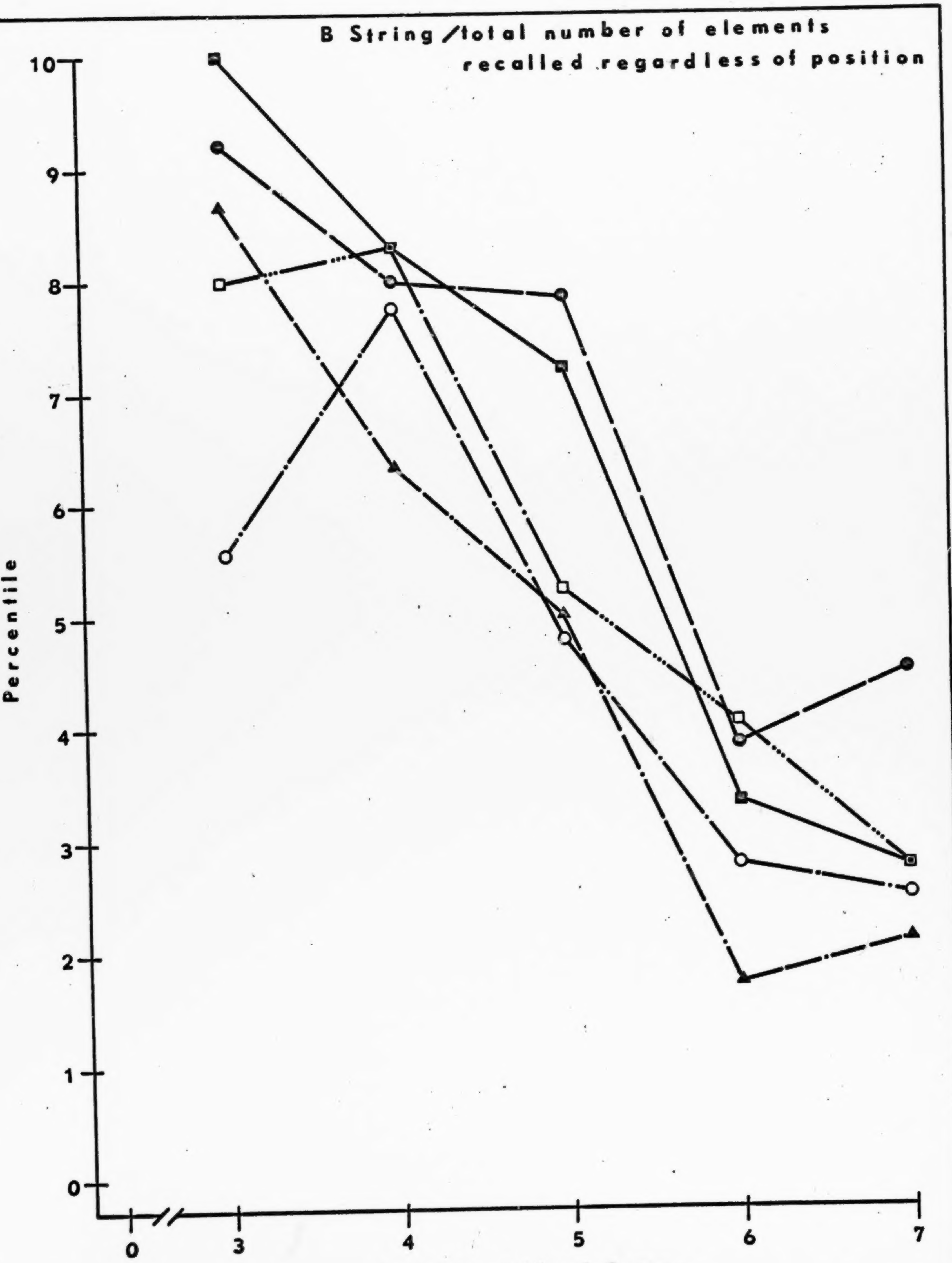

B String/total number of elements recalled regardless of position
Percentile
10
9
8
7
6
5
4
3
2
1
0
0
3
4
5
6
7
Length of Word String

Fig. 3

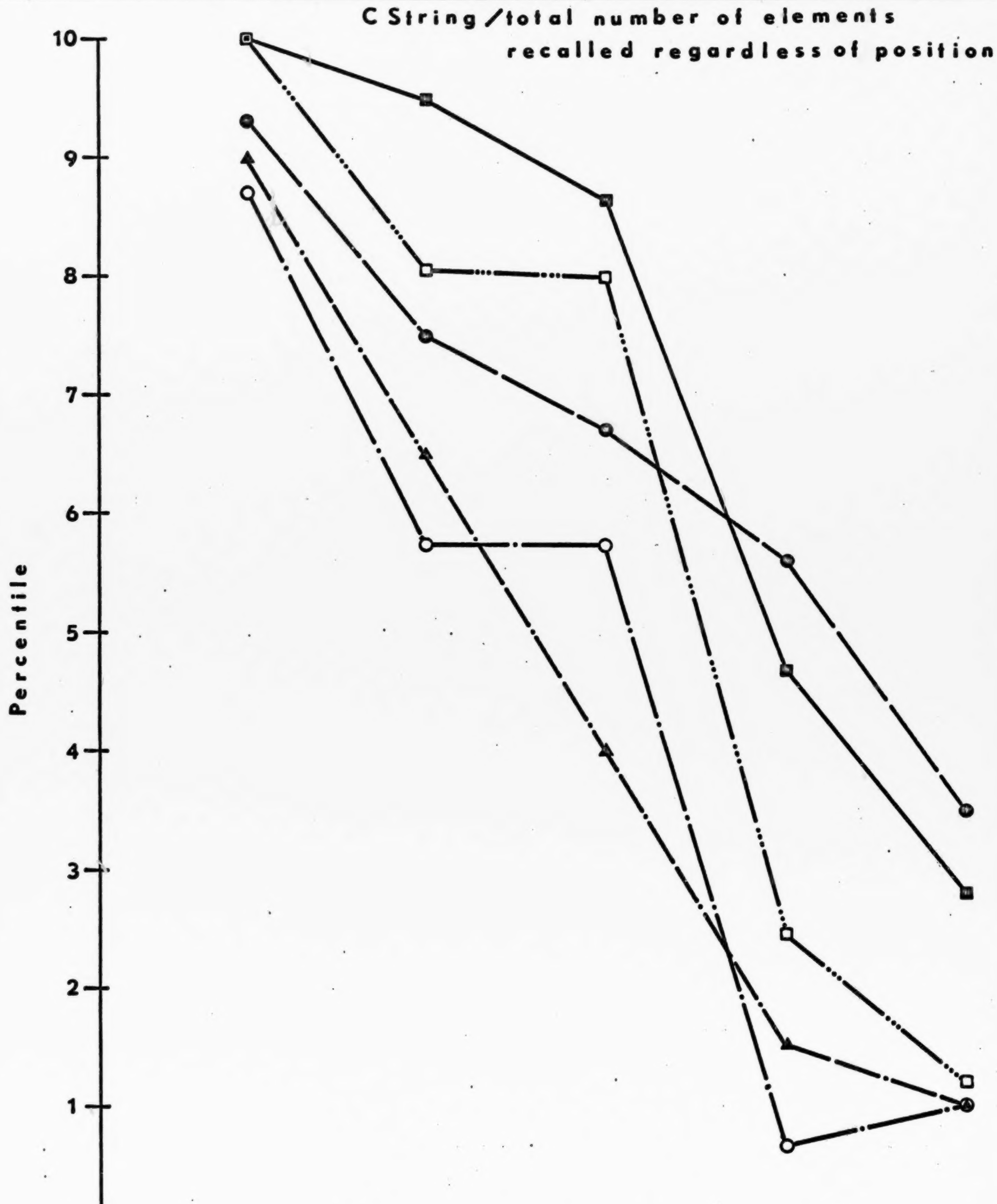
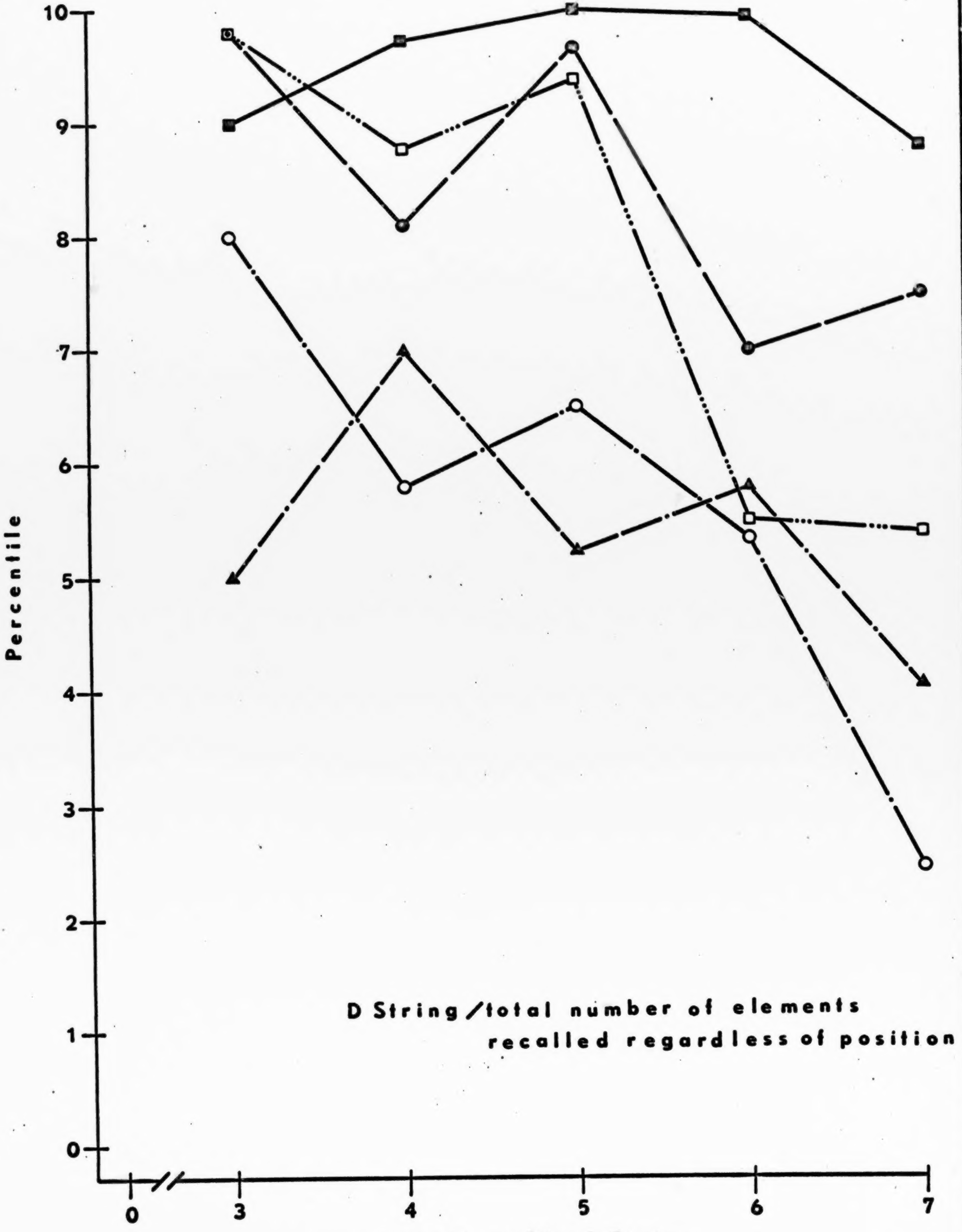

C String/total number of elements recalled regardless of position
Percentile
10
9
8
7
6
5
4
3
2
1
0
0
3
4
5
6
7
Length of Word String

Fig. 4



D String/total number of elements recalled regardless of position

Fig. 5

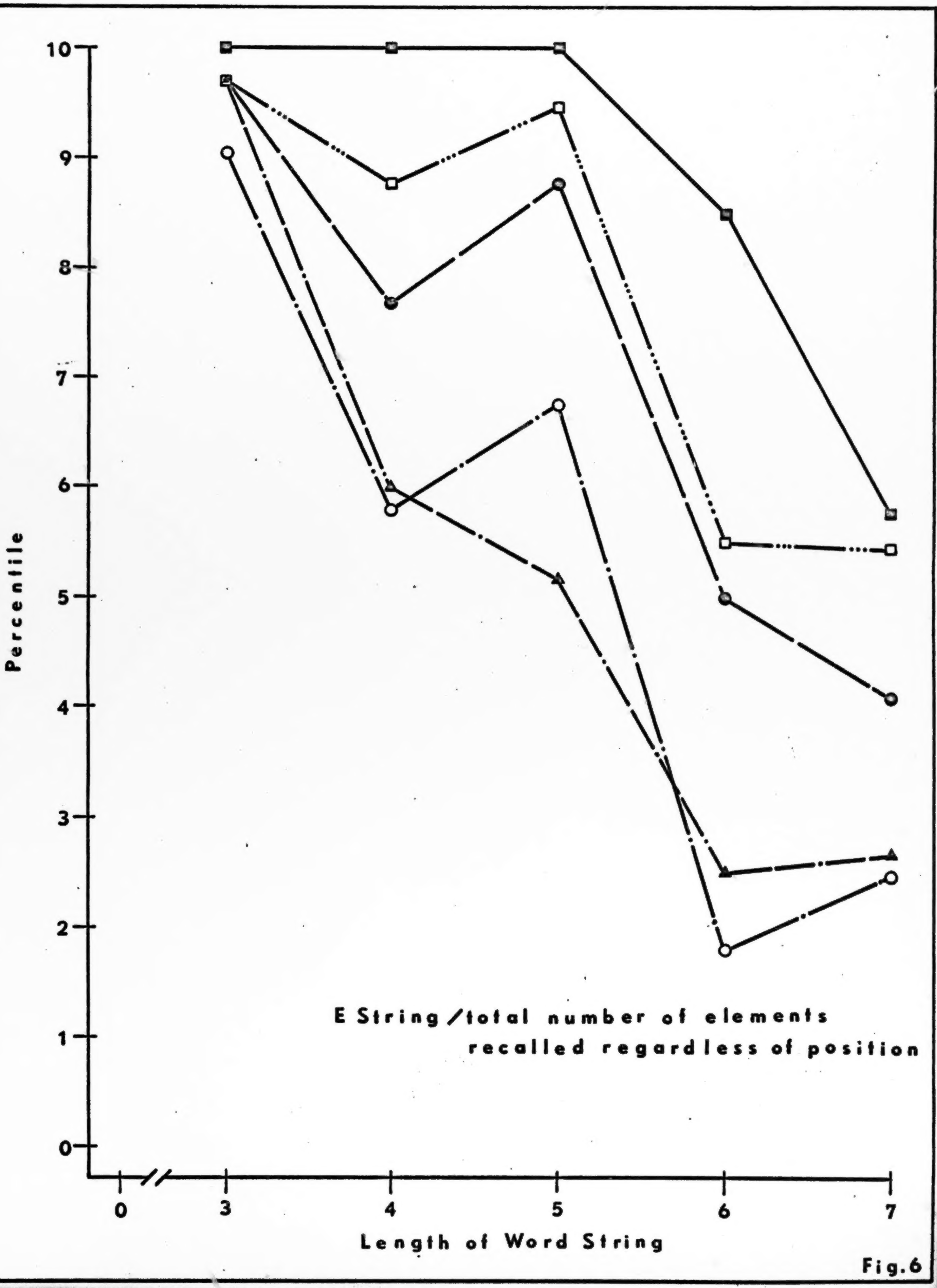

10
9
8
7
6
5
4
3
2
1
0
Percentile
0
3
4
5
6
7
Length of Word String
E String / total number of elements recalled regardless of position

Fig. 6

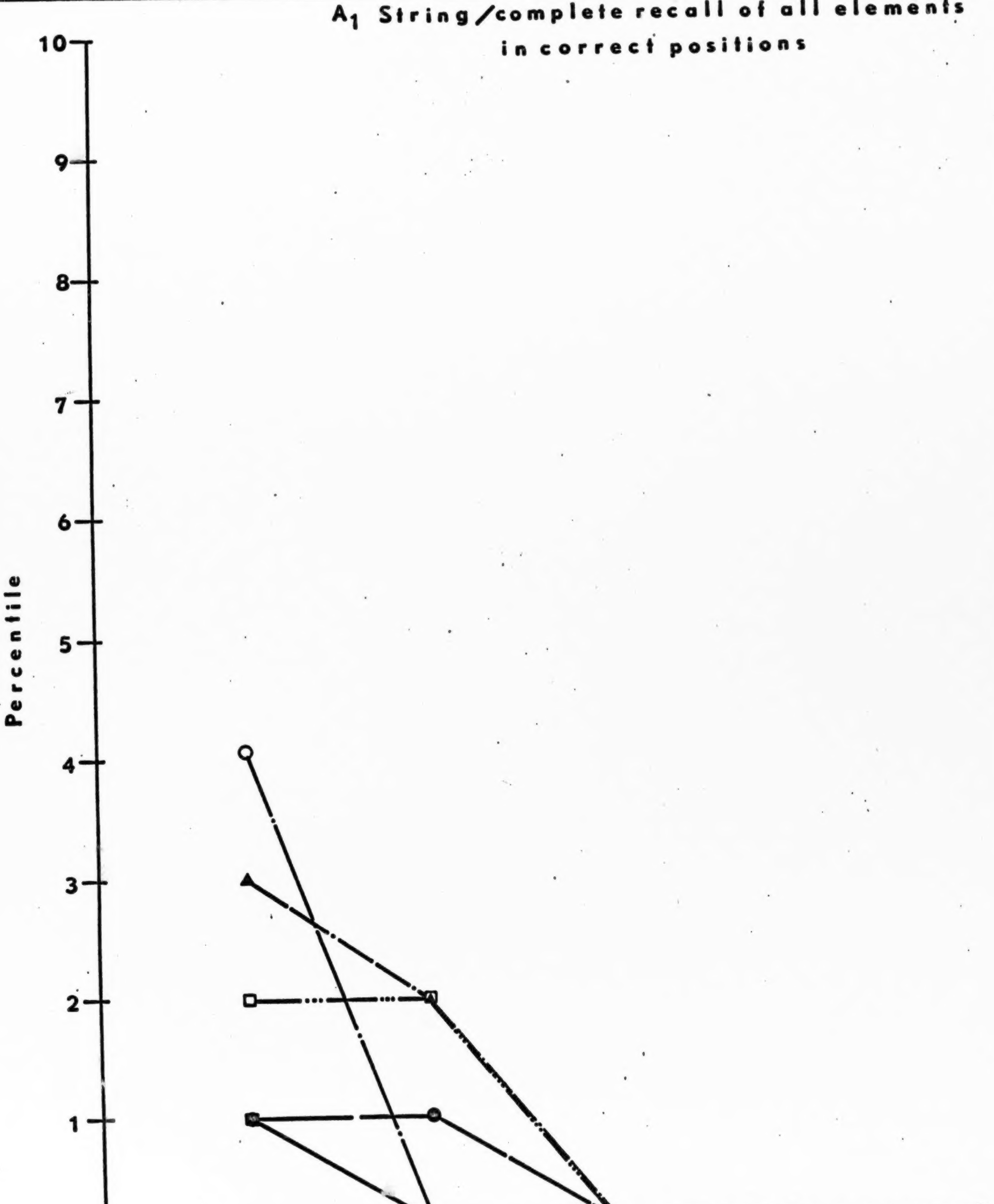

A_1 String/complete recall of all elements in correct positions
Percentile
10
9
8
7
6
5
4
3
2
1
0
(■·●·▲·□·○)
0
3
4
5
6
7
Length of Word String

Fig. 7

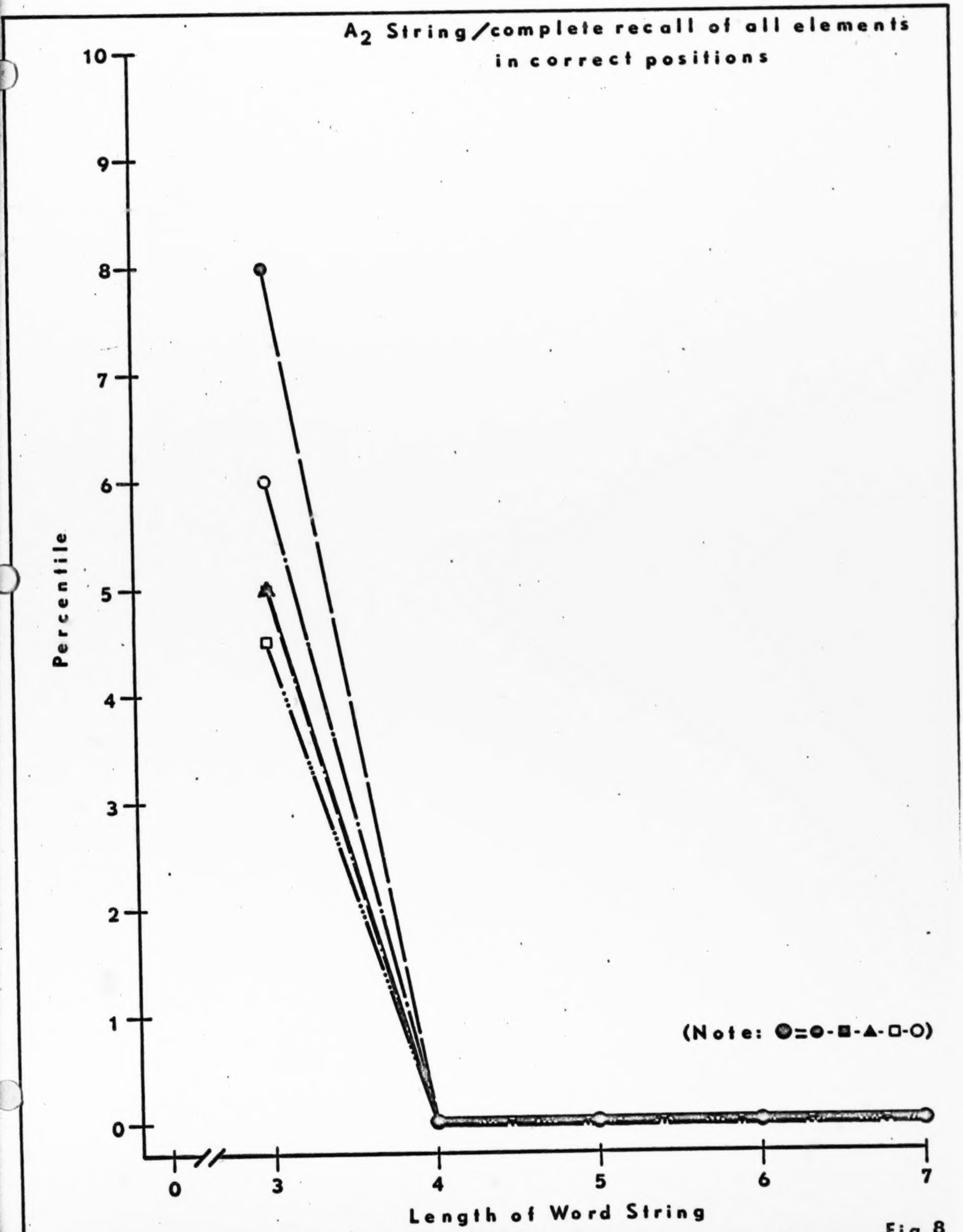
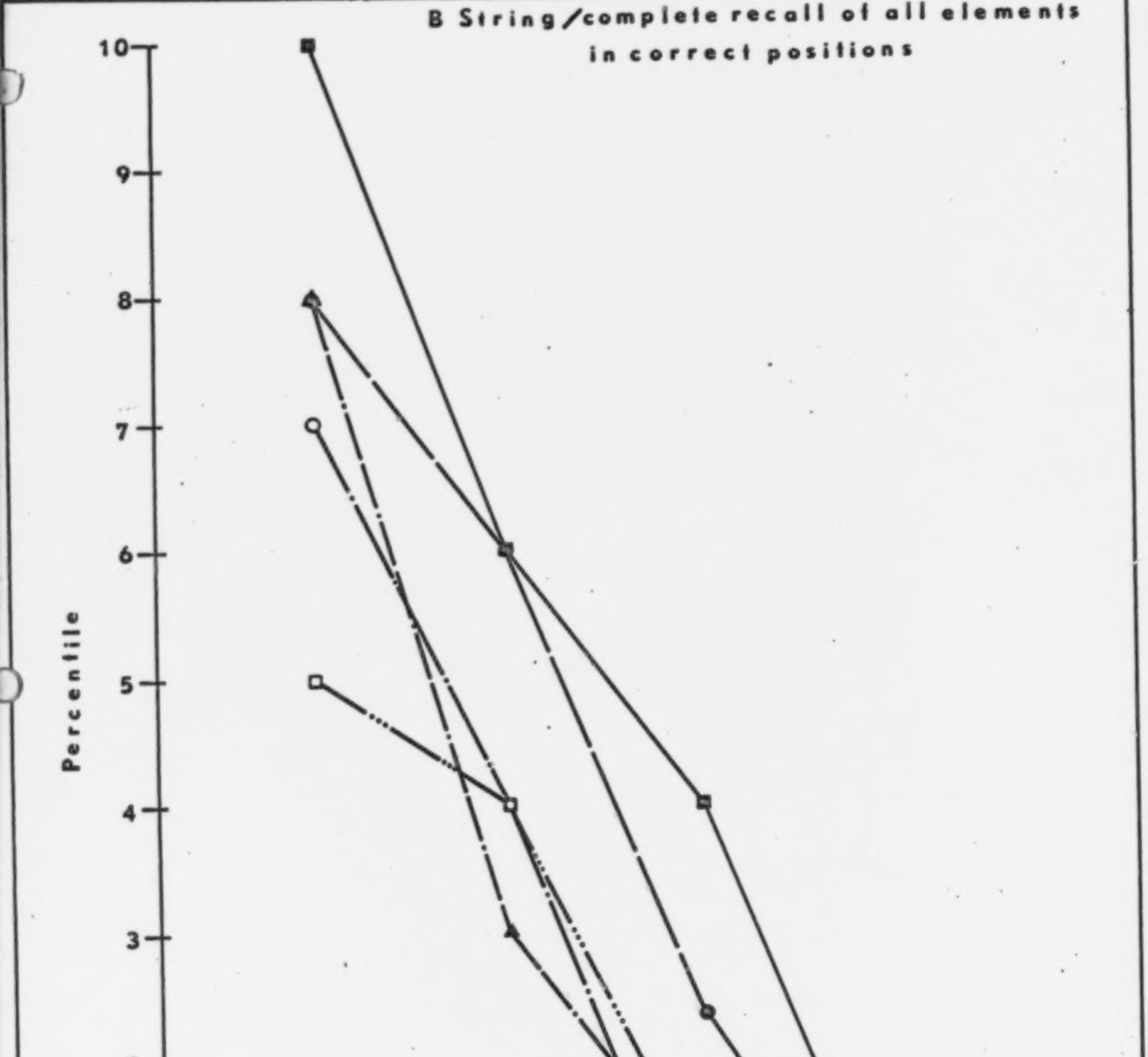

A$_2$ String/complete recall of all elements in correct positions
Percentile
10
9
8
7
6
5
4
3
2
1
0
0
3
4
5
6
7
Length of Word String
(Note: ●=●-■-▲-□-○)

Fig. 8



B String/complete recall of all elements in correct positions

Fig. 9

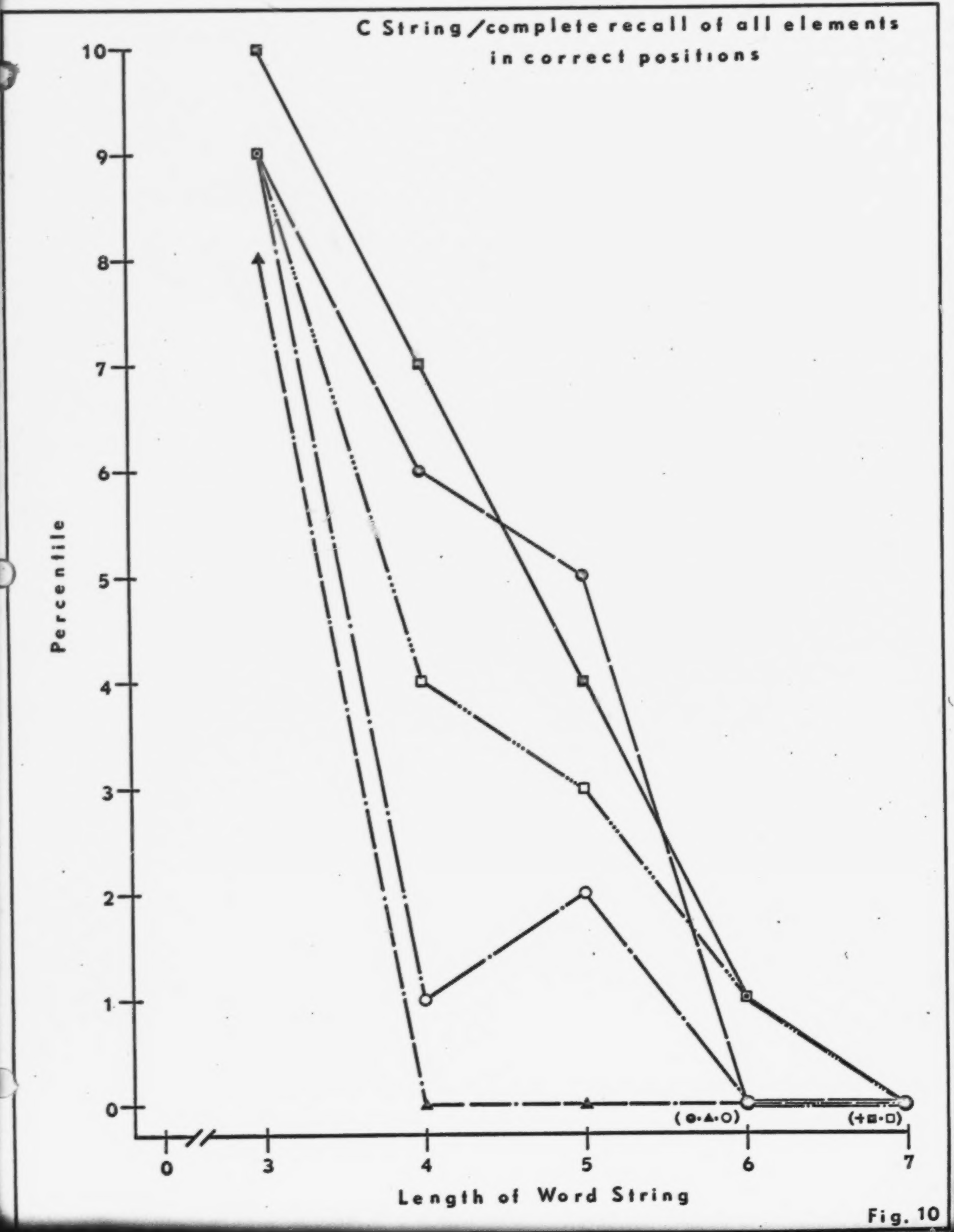

C String/complete recall of all elements in correct positions
Percentile
10
9
8
7
6
5
4
3
2
1
0
0
3
4
5
6
7
Length of Word String
(●·▲·○)
(+■·□)

Fig. 10

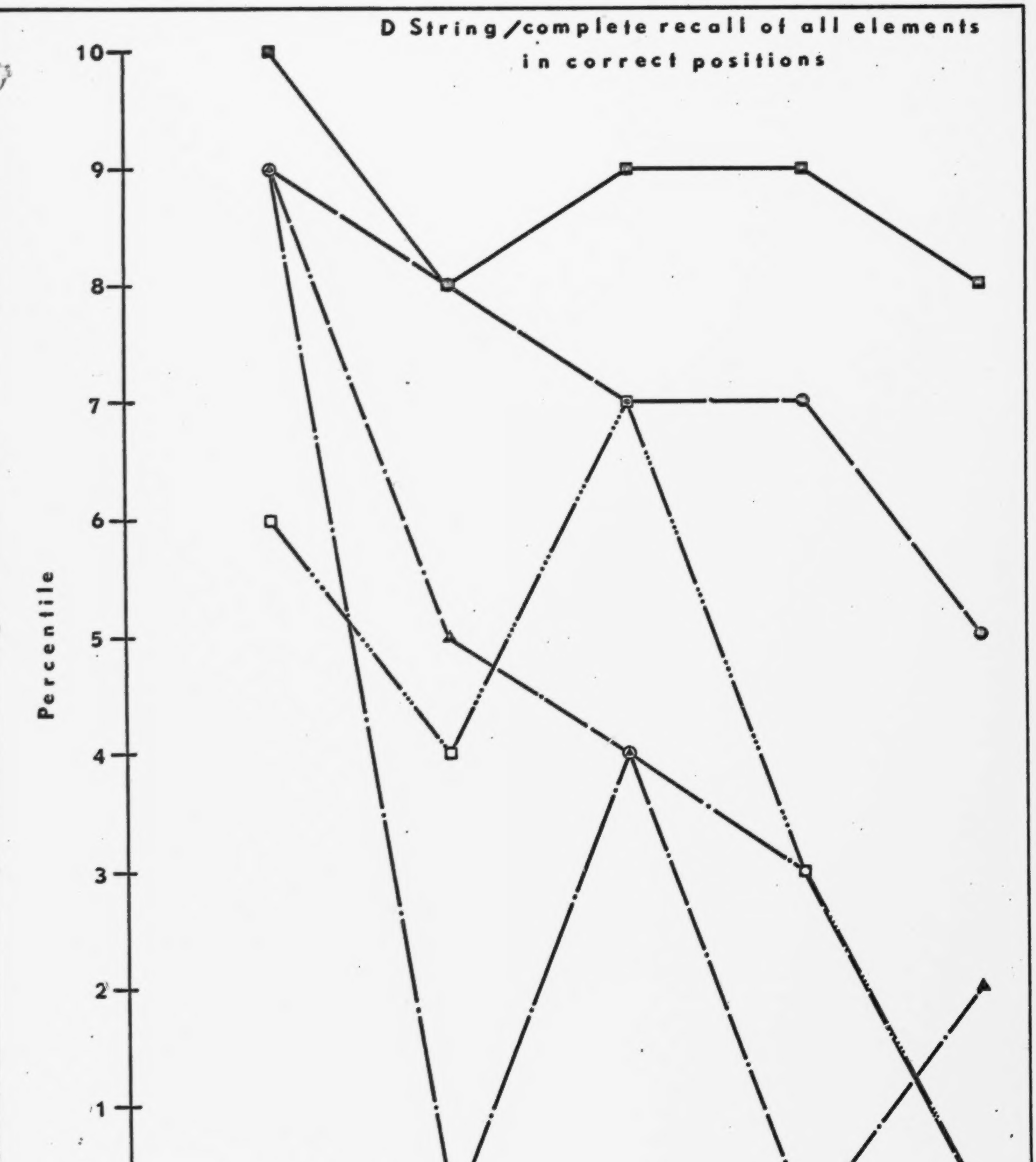

D String/complete recall of all elements in correct positions

Fig. 11

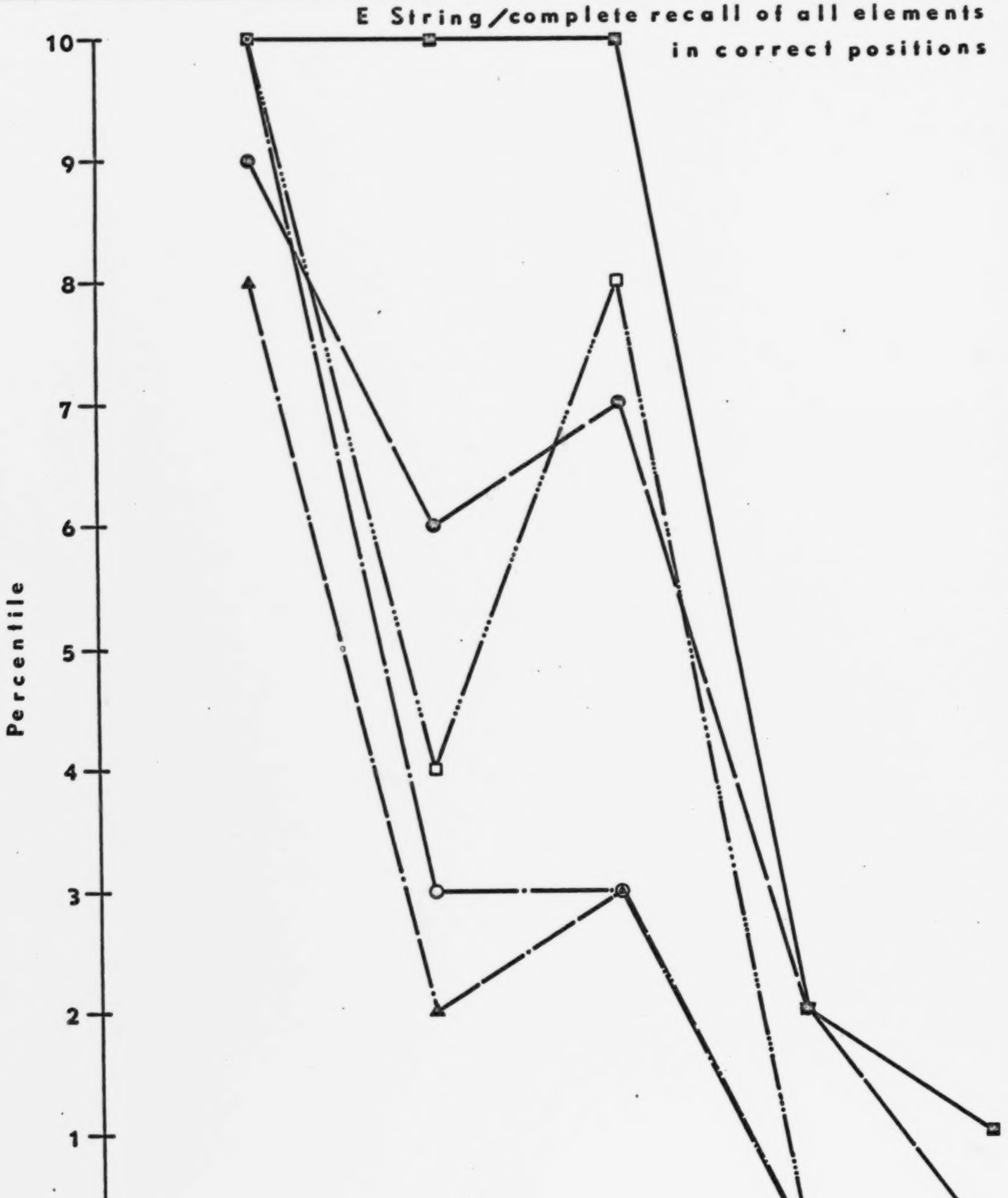

E String/complete recall of all elements in correct positions
Percentile
10
9
8
7
6
5
4
3
2
1
0
Length of Word String
0
3
4
5
6
7
(●·▲·□·○)

Fig.12